UNITED STATES DEPARTMENT OF AGRICULTURE
AGRICULTURAL RESEARCH SERVICE
SOUTHERN UTILIZATION RESEARCH BRANCH

PROCEEDINGS

OF

FIFTH COTTONSEED PROCESSING CLINIC

AT THE

SOUTHERN REGIONAL RESEARCH LABORATORY

NEW ORLEANS, LOUISIANA

IN COOPERATION WITH

VALLEY OILSEED PROCESSORS' ASSOCIATION

MARCH 12-13, 1956

F O R E W O R D

These proceedings are a summary of the information presented at the Fifth Cottonseed Processing Clinic held at the Southern Regional Research Laboratory, New Orleans, Louisiana, March 12-13, 1956.

Sponsored jointly by the Southern Regional Research Laboratory and the Valley Oilseed Processors' Association,this working conference was attended by one hundred and seven representatives of cottonseed oil mills, equipment manufacturers, users of cottonseed products, linters dealers, commercial laboratories, industry associations, and state and federal agencies in addition to staff members of the Southern Laboratory. The program for the first day was arranged by staff members of the Southern Laboratory and for the second day by officials of the Association.

Major attention at the Clinic was focused on the problems of production, marketing and utilization of linters for various end uses; and on problems and progress in oil mill processing of cottonseed with emphasis on improved product quality.

C O N T E N T S

Second Day

W E L C O M E

By

C. H. Fisher, Chief
Southern Utilization Research Branch

I am happy to have the privilege of welcoming you--both for the Southern Branch and myself--to the Fifth Cottonseed Processing Clinic. The earlier Clinics have served a useful purpose and I feel certain that the Fifth Clinic also will be very successful.

An examination of the attendance list shows that we have guests attending the Clinic from Southern States and from more distant regions, including Missouri, Illinois, Ohio, New Jersey, Delaware, and Washington, D. C. We are grateful because you are visiting us. We wish to thank the Valley Oilseed Processors'Association for the privilege of co-sponsoring the Clinic.

Our program this year includes a symposium on linters. I'm certain that we in the Southern Branch will benefit from the information that will be presented at the Symposium. We wish to thank the speakers of the Symposium for coming to New Orleans and appearing on the program.

I should like to take a few minutes of your time to review some of the activities of the Southern Branch since the last Clinic. We have continued to publish papers describing our research at the rate of approximately 130 per year. Many of these were on oilseeds and oilseed products. Some of the papers describe developments having direct, practical value to the farmer and the industries processing Southern farm crops.

I believe we told you last year that Mr. William J. Martin, a cotton expert in Federal Extension Service, was assigned the task of working with us to accelerate the adoption and use of results obtained in utilization research on cotton. This arrangement is working very well. A somewhat similar step was taken last summer to improve coordination of activities in the Southern Branch with those in Agricultural Marketing Service of USDA. I refer to the fact that Mr. Richard Hall of AMS has been stationed in the Southern Branch. We are very pleased to have Mr. Hall with us and we feel that his coordinating activities are proving to be very helpful.

Probably some of you know that Mr. J. A. Kime, who has played an active role in the Oilseed Clinics, resigned his position with us to accept employment with the Department of Defense at Frederick, Maryland. Mr. Kime was a valuable member of our staff and we shall miss him both professionally and personally.

In closing, I wish to thank Dr. E. Fred Pollard, Mr. F. H. Jarrell, Mr. C. E. Garner, and others for developing an excellent program and making other arrangements necessary to have a successful Clinic. I wish also to express the hope that your participation in the Clinic will prove to be both pleasant and profitable.

RESPONSE

By

F. H. Jarrell, President
Valley Oilseed Processors' Association
The Buckeye Cellulose Corporation
Little Rock, Arkansas

Research is responsible for many of the great advances of modern industry. This has required the development of technical skill at levels heretofore not contemplated. Technical skill implies an understanding and proficiency in specific activities involving methods, processes, procedures, and techniques.

It involves human skill, or the ability to work effectively as a group member and build cooperative effort. It requires an ability to translate knowledge from one person to another, which rapidly approaches what we might call team work. This means an exchange of information between individuals and groups. This is sometimes referred to as communications. Technical skill is primarily concerned with working with things, while human skill is primarily concerned with working with people.

In addition to all of this and for effective results, some concept must be had of the job to be performed and how best to do it. This concerns a conceptual skill of how various groups depend on one another, as well as the individual businesses within one industry. Much depends upon the people who make the decision and put it into action, both production and marketwise. This involves the consideration of the technical and human aspects of the problem.

The conclusion, therefore, is that we need three basic personal skills: technical, human, and conceptual. We need sufficient technical skill to accomplish mechanics of the job; second, human skill in working with others; and third, sufficient conceptual skill to recognize the various relationships.

It is more than likely that research is a sort of permission to think individually. We are asked many times these days to glorify conformity and accept collective thinking. Conformity is all right in many things, but the establishment of common thought submerges individuality. Research should not be confined to any one individual or group. Research is more than likely a climate in which a person can think alone and perhaps arrive at an unusual opinion and not be considered unusual.

The research program of the Valley Oilseed Processors is a real undertaking, and all thinking members of the industry are grateful to those undertaking this work. The various groups brought together for exchange of ideas on problems of mutual interest within our industry affords an opportunity for the clarification of many of our problems. Through these contacts, many individuals have already improved their operations.

We are very grateful to all who have contributed to this program. It is unnecessary to point out the various individuals within our industry who have devoted so much time and effort to this work. I am sure that they, as well as the entire industry, are extremely grateful to Dr. Fisher and his staff for their devotion to our cause. The Laboratory staff has moved into this work like the veterans they are, and their ability to grasp our problems in such quick manner has proven quite valuable in our undertakings. All of our trips here to the Laboratory have been most interesting and educational, so we say to the S R L - Thank you very much for your efforts and cooperation in our behalf in all of this work.

SYMPOSIUM ON LINTERS

UTILIZATION POTENTIAL OF COTTON LINTERS

By

J. J. Spadaro
Southern Regional Research Laboratory

In looking through a book entitled the "Rayon Industry" last week, I came across a sentence which I would like to quote: "Cotton linters are almost exclusively used for the production of nitro-cellulose, acetate and cupra-ammonium rayon."

This statement surprised me because I knew that about 80% of these markets were supplied by wood pulp. The publishing date turned out to be 1927. It is true that in those early days linters enjoyed many exclusive markets but today the picture has changed radically--in practically every end use linters are in competition with other materials. The technology of linters production and of linters utilization has not kept pace with that of competing materials. This may be due to the fact that linters are a by-product of the oil mills, and, I believe another reason is that there appears to be a big gap between the linters producers' and the linters consumers' knowledge of each other's problems. The narrowing of this gap, which is one of the objectives of this meeting, should prove beneficial to both in the utilization of linters. To attain this end we have made a special effort to have representatives of linters consumers, linters dealers, and linters pulp processors on the program of this Clinic. These industry representatives, listed on the first page of the program, are recognized as being outstanding men in their respective fields.

The linters dealers and linters pulp producers (or bleachers) have played a very important role in narrowing this gap, and I believe will continue to do so in the future. I feel that industry organizations such as the National Cottonseed Products Association and the American Cotton Linters

Association as well as government laboratories such as this one can increase their contribution from a technical viewpoint to improve linters utilization.

Of the four products obtained from cottonseed (oil, meal, hulls, and linters)--the linters have a wider variety of uses than any of the other products. Most of you would be amazed, as I was, to learn the number of ordinary household articles that contain or were made from linters or linters-like materials. I counted 38 items around my home. They included: dining-room chairs, kitchen chairs, overstuffed chairs, sofa, sofa pillows, and mattresses; padded items for baby's high chair, for bassinet, , crib bumper guards, bottom and sides of carriage and baby car bed; and there were auto car seats, photographic film, phonographic records, paper, rayon articles, etc.

Some products that the average person would not even suspect involved the use of linters are storage batteries, linoleum, food thickeners, and sausage casing.

Since cotton linters are utilized in the manufacture of such a wide variety of consumer and industrial products, one would expect that linters would be literally "gobbled up" as fast as they are produced. But, they are not, and the answer can be given in three parts--first, there is strong competition from other products; second, the failure of linters technology to keep pace with improvements in competing materials; and third, the fluctuation of price. I will not say much about the price fluctuation since it will be covered by Mr. Hall. I will only say that once a consumer, such as a rayon manufacturer, converts to the use of wood pulp during a period of high prices, he hesitates to return to linters pulp due primarily to reconversion costs.

Cotton linters has had increased competition from wood pulp, cotton and rayon wastes, foam rubber, paper batts, jute, sisal, and even imported India lint cotton. Even in minor chemical pulp uses, wood pulp technology has increased to such an extent that, as heard at a recent meeting, "wood pulp can now almost completely replace linters in the chemical pulp field."

If I were to summarize in three words the linters factors desired by the majority of consumers they would be "clean, long, and economical." By economical, the consumers do not mean that linters should sell for less than the current price. They mean that higher quality linters should be produced without raising the price above the level of competing materials, some of which sell at prices several times that of linters. The following table outlines briefly the order of importance of linters characteristics for the major end uses.

Linter Characteristics	Order of Importance			
	Chemical Pulp	Paper	Felting	
			Covered	Exposed
Cleanliness	1	1	3	1
Fiber length	-	2	1	3
Resilience	-	-	2	5
Color	2	3	4	2
Permanent set	-	-	5	6
Absorbency	-	-	6	7
Crimp	-	-	-	4
Dispersability	3	4	-	-

Now you may ask what determines the characteristics of linters. These characteristics are the results of factors initiated as far back as the cotton growing period. The variety of cotton, the location, and whether or not irrigation is used all affect the quality of linters produced from the seed.

The method of picking cotton, as we all know, affects the trash content of the resulting linters.

At the oil mill, the method of seed cleaning, the delintering procedures and the flue and condenser methods of collecting the linters from the linters machines all affect linters characteristics. I won't go into any details since these factors may be covered in various talks throughout the day.

Another question you may ask is, "How do these characteristics affect the end products?"

The effect of these characteristics on felting uses are reasonably obvious. Fiber length and resilience imparts the necessary harshness, bounce, character, etc.

In papermaking, cleanliness, fiber length and color all contribute to the ultimate strength of the final paper. Linter cleanliness contributes to the strength characteristics of the paper in that increase of foreign matter makes it necessary to cook and bleach at conditions which have a tendency to weaken the fiber.

Linter cleanliness and strength are the two problems limiting the use of linters in papermaking. A responsible person in the paper industry stated that "any improvements in the way of producing cleaner linters will lead to increased utilization of linters." He feels that linter cleanliness is an

oil mill problem and strength a paper mill problem. Several paper mills are cooperating with bleachers, with the Writing Paper Manufacturers Association, and with a research institution in the conduct of research to improve strength by both mechanical and chemical means. I won't discuss this research nor the detailed effects of foreign matter since Mr. Dixon, I believe, plans to cover these points.

In regard to linter cleanliness for chemical pulp use I want to elaborate a little bit because of its importance.

Linters are an excellent source of high quality cellulose; and they are preferred in producing cellulose pulp because of the high alpha cellulose content, high reactivity, clarity, strength, and high viscosity--all considered desirable characteristics. But, presence of foreign matter has a detrimental effect. Foreign matter decreases cellulose yield and yield is one of the big advantages of linters over wood pulp for the manufacture of cellulose derivatives such as carboxymethyl cellulose. The presence of silica tends to block spinnerets and to wear them out. Purified linter pulp contains about 5 ppm of silica as compared to only 1 ppm for wood pulp. Cockle burrs and shale are especially bad--they will not cook out and tend to show up as specks in the final products. Hull particles can be cooked out but if not thoroughly removed, they will produce a haze or turbidity in the subsequent cellulose solutions. This clarity characteristic is very important in making cellulose derivatives such as the cellulose acetates to be used in the manufacture of clear plastics and films. Wood pulp has a disadvantage in this field due to the presence of hemicelluloses such as xylan and mannan, the last traces of which are difficult to remove. These minor components are not reactive and, therefore, cause turbidity; and, in nitrated pulps they affect stability.

I'd like to point out, however, that the extensive wood pulp research being carried on by many organizations may solve this problem, as it has solved other problems. For example, a large manufacturer of cellulose derivatives has assigned three men since 1945 to work exclusively on the improvement of wood pulp characteristics. One result of their research is that they are now able to use mixtures of linters pulp and wood pulp for the manufacture of cellulose ethers. The methyl ethers are used as a base for other cellulose derivatives. It is this type of technological competition that linters has to either keep pace with, or find itself at an economical disadvantage. No doubt more chemical research is needed in the dissolving pulp field for linters.

Recently I learned that even minor metal components such as iron and manganese affect the production of methyl and ethyl cellulose. A large company is now working with pulp producers to minimize these metal components.

A disadvantage of linters pulp is the slow filterability characteristics of the cellulose solutions as compared to that of wood pulp. Some improvements have been made by the use of chemical additives but more research is needed.

In the production of the cellulose derivative for the manufacture of sausage casings, linters pulp is preferred because of the wet strength characteristics. Sausage casings, once produced entirely from linters cellulose, now utilizes a significant quantity of wood pulp.

To summarize--two factors indicate excellent utilization potential for linters. First, the wide variety of products for which linters can be used and second, the inherent high quality of linters cellulose. But, the competing products available for practically all end uses tend to minimize this utilization potential. Research on linters should, therefore, be expanded wherever possible with the cooperative help of the oil mills, linters dealers, pulp processors, and consumers. Also it may be possible for agencies such as the National Cottonseed Products Association and the American Linters Association to expand their activities to include linters research.

There are some examples of fine cooperative work that has been carried on by some organizations. The cooperative effort of a group of paper mills with bleachers and a research institution has been mentioned; an oil mill company in Texas has worked with bleachers and with equipment manufacturers to produce higher quality linters; it is my understanding that the use of linters in battery boxes was instigated by a linters dealer--cooperative work must have been involved; an oil mill is actually producing a product of linters garnetted with a longer staple cotton--this must have been the result of cooperative effort; a manufacturer of sausage casings has worked closely with an oil mill to obtain the quality of linters he desires.

Cooperation is necessary for optimum utilization of cotton linters.

MARKET POTENTIAL OF COTTON LINTERS

By

Richard Hall
Agricultural Marketing Service

The trends in production and domestic consumption of cotton linters have been upward with domestic production averaging 260,000 bales greater than consumption during the five year period, 1950-54. In 1950, there was a serious market upset due to poor production and the war emergency. The effects of high price and tight supplies in that year still exist in the market.

In chemical uses, the major market for linters, linters compete with heretofore cheaper wood pulp. Quality factors concerning foreign matter content and processing problems now restrict potential utilization under a favorable price structure. The market this year is estimated at 1,000,000 running bales.

In nonchemical uses, price competition with other raw materials is emphasized over characteristics. Even though linters use is up here, potential estimated at 650,000 bales has not been reached.

Combining chemical and nonchemical uses of linters with exports, disappearance is estimated at 1,930,000 bales. Current consumption rate estimates place this figure at 2,050,000 bales for 1955-56.

Increased utilization this year will reduce carryover, but not to the extent potential use under favorable market conditions seem to indicate. Opportunity for increased utilization of cotton linters through research has, perhaps, never been more favorable.

DISCUSSION

Phillips: Mr. Hall, I believe you said there is a market for 1,800,000 bales, which market you said was in excess of supply.

Hall: I'm sorry that I gave the impression that there is a consumption or potential greater than supply. My totals were for showing what the estimated production will be this year, and the consumption was merely to show that in spite of a standard increase in consumption this year, under the total current rate of consumption, our stocks or carryover from previous seasons will still be close to annual domestic consumption. This year's production is estimated at 1,700,000 bales. I estimated domestic consumption at 1,650,000 bales. However, at the current rate of consumption (March 1956) the annual consumption would be 1,750,000 bales, slightly over domestic production.

USE OF COTTON LINTERS IN PAPERMAKING

By

H. P. Dixson
Fox River Paper Corp.
Appleton, Wisconsin

First of all I would like to clarify the use of cotton fiber in the rag content segment of the fine writing paper industry. Originally all papers were made of rags. The development of the mechanical means of producing paper in a continuous web greatly increased paper production. Both European and American manufacturers became short of fiber supply. About 1840, mills were constructed to use straw as a basic fiber--pieced out with rag fiber to make the paper acceptable. About 1850, daring leaders were experimenting with pulp from wood and by 1870 the die was cast and fiber from wood became the dominant economic factor in paper production. Today, however, some thirty odd mills produce papers containing 100%, 75%, 50%, and 25% cotton fiber. The balance is usually wood pulp. Cotton is still recognized as the best fiber to produce the desired combination of high strength, extreme brightness and whiteness, and maintain these properties the most effectively against the ravages of time.

Even as in 1850, the present rag content mills industry is faced with the problem of where to obtain sufficient raw material. Today we are confronted with the contamination of cotton fiber by cleverly incorporated synthetic fibers and dyestuffs that are practically impossible to remove.

The cotton fiber paper group realized this even before World War II. It was driven home much more sharply afterward. Cotton linter pulp, produced primarily for the chemical industries, has long been used by the paper industry for special sheets. The consumption was very minor. The cooking and bleaching conditions required for chemical linter pulp uses render the pulp undesirable for high strength papers such as are customarily produced from rag fiber. Furthermore, the bleachers concentrated on a second cut linters. The fiber length is too short for the rag users equipment.

Necessity is still the mother of invention. During World War II, cotton fiber supply became so serious that the rag content mills were willing to try anything to secure fiber. Our mill was helped out by being supplied with used and surplus GI mattresses. We devised means of mechanically slitting up the mattress so that the cover and linter filling could be fed through our conventional rag cutters. To make a long story short, after processing thousands of GI mattresses we concluded that it looked feasible to produce cotton content paper from long-fibered linters, and that we would direct our post-war development toward this end.

It is my understanding that the purpose of this portion of our Symposium is to bring to the attention of this group, the problems that confront the consumers of linters. In my case the consumer is the cotton-content paper mill. For many years rag clippings have been the source of fiber. These clippings from all manner of textile operations are sorted into many categories. There is little purpose in enumerating these but broadly they are divided into unbleached and bleached white grades, colored grades easily bleached, and colored grades difficult to bleach. The clippings are cut into uniform small pieces and treated with mild alkali digestion to remove color, natural fat and waxes, textile oils, etc. The cooked fiber is washed and reduced to individual fibers, usually in what is called a Hollander washer-beater. This machine is charged with the alkali cooked rag pieces at about 3% consistency. A rotating roll of steel bars working against a set of fixed steel bars called the bedplate, tears the rag pieces apart. At the same time clear water is added to the mixture and the dirty water removed from the vat by a wire mesh cylinder. There are traps in the bottom of the washer tub that remove buttons, hooks, sand, shipping soil, etc. The rag pieces are not only torn apart but the separated fibers are cut in length and become bruised and made pliable. We call this increase in pliability hydration. A mild laundry type of bleaching is carried out in the Hollander washer-beater also. The end product is a completely defibered, white cotton fiber, ready for the final application of more beating before becoming a sheet of paper. It is known as half-stock, probably because the stock is about half beaten to a condition suitable for the formation into a sheet of paper. I have a few dried samples of this half-stock for your inspection which I will pass around later.

What happens when we pass linters through the same process? First of all, we do not have to unweave them. That is an advantage. What next? The dirt problem strikes us head-on. In general, the rag products we receive have been cleaned for us by the textile people. Their processes remove all field trash that gives us so much difficulty. Raw linters as

received [illegible] only have the field trash carried by staple cotton from [illegible] also have all the special dirt products that appear in linters. You know the various categories better than I do, I am sure.

After the conventional cooking, linters are added to the washer-beater. Fine pepper dust will pass through the washer cylinder screen. [illegible] hulls, shale, etc., gradually collect in the button catcher previously mentioned. This can best be accomplished by reducing the consistency in comparison to rags, but thus the equipment capacity is reduced. Even under these conditions dirt removal is poor. The button catcher soon fills up as the amount of linter dirt is so large compared to the small amount of dirt in rags. Some mills try to dump this catcher but it is not an easy operation without risk of losing fiber. The net result is that the stock is seldom adequately cleaned in conventional equipment.

We have improved on the washer method by using an entirely different system. After mild alkaline digestion, the cooking liquor is washed from the linters on a vibrating screen. Some fiber is lost, but it is the undesirable portion that is too short for paper mill use. The linter fiber is then pumped through a Jordan Engine that has been somewhat modified to prevent the stock from plugging it up. This machine consists of a rotating cone in which steel bars are imbedded and a fixed conical shell that also contains imbedded steel bars. Its action is somewhat similar to the beater-washer but its construction allows for continuous operation. The fiber is given a light combing action in this Jordan Engine to try and separate some of the dirt entangled in the fibers. The stock is then diluted to less than 1% consistency and passed over a long riffle. The dirt settles to the bottom and is trapped in cells. There are many tricks to coax the dirt to settle especially when long-fibered linter stock is riffled. Success varies. I understand centrifugal hydraulic cleaners have been successfully applied.

I want to take some time to explain the dirt problem as it affects our operation. Extra fine dirt such as pepper dust and sand does not bother us too much. True, it represents a physical shrinkage and means that a linter with less of this material is more desirable, but this situation can be corrected by a price adjustment. We have found that whole seed, shale and other boll particles, and portions of stem and leaves cause a great amount of difficulty. These larger particles become so entangled with the fiber that we cannot separate them. Sometimes the stock and leaf particles are bleached to a light tan color and if light enough do not cause too much trouble, but in general we cannot bleach enough without destroying fiber strength. Most pieces of the boll or large seed fragments do not bleach at all.

At this point I would like to pass around some pulp samples to give you an idea of what we are talking about. The samples are labeled:

1. Rag Half Stock
2. First Cut Linter Pulp
3. Mill Run Linter Pulp
4. First-Cut Linter Pulp that did not clean up properly.

The cotton content paper industry cannot tolerate dirt in paper. Exceptionally clean paper is one of our selling points. We know that cleaning linters has been given considerable attention by you producers and we are very grateful. But you must remember that one of the reasons linters have not replaced textile clippings at a faster rate is due to a great extent to the problem of dirt. You can do a lot for us without purchasing a single piece of equipment. Make a determined effort to educate your employees to keep floor sweepings and general trash out of your baling machines. I would dread to total the number of 8000 pound cook batches of perfectly good linters that have been completely ruined by a layer of trash in one bale. We know as well as you that employees make mistakes, but try to educate them and educate yourselves to the fact that it does make a big difference to a paper mill whether that layer of dirt gets by.

Speaking of linter defects, we also have considerable color difficulty with premature seed or hot seed.

You may perhaps be speculating on the question of why dirt is such a problem for paper mills when bleachers remove it without too much difficulty most of the time. As you know, the type of dirt described as being most difficult for us to remove is the most prevalent in the longer fibered linters, i.e., long first cut. Paper mills have never been able to develop the same physical strength from linters as they can obtain from lint fiber. Therefore, they have stayed away from the second cut linters used by the bleachers. Also, the mills have discovered that light cooking and bleaching procedures tended to promote strength. Therefore, they cannot clean up linters that are on the dirty side by the conventional methods of overcooking and bleaching that can be exploited to some extent by the bleachers.

I would like to tell you what we are doing about investigating the strength problem of lint vs. linters. It is our most important field of endeavor because we believe linter producers will solve the dirt problem.

Why certain fibers produce a strong sheet and why others do not is very complex. We now know that with conventional strength development equipment, cotton lint fiber cut to the same length as a linter fiber--both at the same viscosity after cooking and bleaching--produces a stronger sheet of paper than one from linters. Individual mills have spent a lot of research time on this problem. Groups of mills have exchanged technical data on the problem. Paper mills and fiber refining equipment manufacturers have carried out joint experiments. By taking advantage of every known trick of high consistency refining, special bar fillings in refining equipment, and by blending with extra strong stock, and extra application of power, we have come part way in substituting linters for rags. But we are not there yet.

To try and take further steps, the Rag Content Group of the Writing Paper Association in cooperation with some of the bleachers of linters decided to carry out a fundamental research project on the problem. Our first phase was to secure a comprehensive bibliography on linters and

allied subject matter which might throw some light on the problem. We employed the Institute of Paper Chemistry to do this work. This work is in progress. Inasmuch as we insisted on a fundamental approach, there is not much practical result apparent to date. But we believe this phase is not too far away. For example, we know that the linter fuzz fiber is different than the pieces of true lint stubs left on the seed. It is thicker walled and does not fibrillate, that is unwind, as readily as lint fiber under beating conditions. We must find a way to chemically, physically, or mechanically induce this fiber to unravel because that is at least partly why fibers develop strength upon beating. Then too, there may be other differences that prevent a linter pulp from developing strength. I am just giving you some idea of the complexity of the problem.

The thought I want to leave with you is that many individuals and companies are spending a great deal of time and money on linter utilization for paper. We want your cooperation in studying the technicalities and the economics in producing clean linters. You are best equipped in know-how to do this. Our industry wants the actual facts on this subject. It also wants the facts of production of extra long fiber linters because long fibered lint will give us the best results until such time as we have more knowledge of how to obtain strength from shorter fiber.

The industry does not know at this time what it can afford to pay for linters. Some mills pay a premium for length and cleanliness. How to measure these features are not clear. The alpha cellulose premium does not at present mean much to us. It may be that the treatments required to make linters equal to rag stock will not allow any premium over what oil mills received from other consumers. That remains to be developed as knowledge is gained.

In 1955 the paper industry used 89,000,000 pounds of rag clippings and 38,000,000 pounds of linters. In other words, the linters constituted roughly 30% of the total. In 1948 the linter consumption was only 15.5% of the total. This increase is due to better know-how in linter utilization and also due to an increasingly difficult rag situation. I think the greater portion of the increased amount is due to technical advances. This paper has been purposely kept away from detailed technical phases of linter use in paper production because I felt it would only confuse the presentation to a group not familiar with paper terminology. However, I welcome any questions technical or otherwise. If you will participate in a discussion I will do my best to answer questions or at least perhaps steer you to someone more qualified.

DISCUSSION

Berkley: You mentioned fiber length. Of what length must the fiber be?

Dixson: We can't get all the strength out of linters that we desire, which is a strength that approaches rag stock. We thought that we could do this best by obtaining the longest-fibered linters that we could get

our hands on. That is what most of us do, but extra-long-fibered linters are a little too expensive, and generally are the dirtiest linters. We want all the length we can get but the longest-fibered linters are too dirty. We can't get them too long.

Phillips: Does a long staple lint which has been cut to the same length as linters make a better paper?

Dixson: A lint fiber, cotton rag fiber, that has been cut to the same length as a linter fiber makes a better sheet of paper.

Bill Knapp: Can you say whether paper manufacturers are installing equipment for cleaning linters?

Dixson: Generally speaking we are not doing a great deal to install equipment to clean up the linters.

Sheffield: We have found that most cleaning equipment will not clean the trash that is objectionable to the paper users. The answer is in cleaning the seed. It is during that operation that the linters should be cleaned.

Fincher: Is the uniformity of the fiber length important to making paper?

Dixson: Unfortunately, there is something about shorter fibers that requires some kind of extra work; it doesn't matter how long they are.

Turner: At what price would staple cotton be competitive with rags or linters?

Dixson: A good grade of unbleached muslin costs about $17.50 per 100 pounds, which is the top price of rags. That price is much higher than that of linters.

Catlin: The increased consumption of linters in papermaking is essentially a very real thing. Cotton linters constitute 65 percent of the total cotton used by our mill. Five years ago we were using lint cotton entirely.

Dixson: We use 70 percent cotton linters of total cotton.

Catlin: The figure of 100,000 bales of linters per year is at least 150,000 bales, and it represents a potential market for cotton linters if everything is solved of over half million bales per year in the paper industry.

Berkley: Have you used the lint from immature cotton?

Dixson: I do recall that something was done.

Catlin: It was found impractical to consider making it an educational research function. However, some laboratories indicated that a better paper might be made from immature lint.

Dixson: You might be interested to know about an experiment that was tried. Perhaps you are familiar with the fact that the industry raised cotton in an attempt to determine whether it was feasible to raise a low grade cotton that was not suitable for textile purposes, but which would be suitable for papermaking purposes. It was formed for 3 years and it was found that it might be practical but it was a borderline case.

ROLE OF THE LINTERS DEALER IN MARKETING LINTERS

By

E. R. Kauders, Pres.
Kauders-Steuber Company
Chicago, Illinois

My experience as a linter dealer dates back over forty years and in that time many changes have been made in the production of linters. The small mills who always made quality linters have long since gone out of business. The present large mills have become so mechanized that it seems their primary purpose is to crush an ever greater tonnage of seed to produce cottonseed oil.

In doing so, linters have become only a percentage of the end product. Since cottonseed oil is the main product of the industry, other factors such as linters and those that buy and distribute them have been relegated to the background of the over-all operation. In this respect there has been no change, which is regrettable, for the following reasons.

You have invited here several representatives of the large users of cotton linters. These people over the years have indirectly become your customers. I advisedly say indirectly because I wish to bring to your earnest attention the part a linter dealer plays in the actual buying of linters and the final distribution of same.

The linter dealer devotes much time, effort and money yearly to perform a real service to the oil mill industry in the marketing of their linters. Perhaps the oil mill industry does not have a genuine realization of the magnitude of the task in handling more than a million bales each year.

Since the linter dealer does his own sampling at the warehouses of the mills, his purchase then is final. He then pays on draft terms and assumes credit risks by extending varying degrees of terms from cash on arrival to sixty days or more. Finally the dealer has been known to take severe losses due to market changes. Above all, he must be a diplomat with the seller, the buyer and his bank. So the linter dealer stands squarely between the linter producers and the actual consumer, to the satisfaction of both. Therefore, if the oil mill industry is to keep

their present linter markets, they must assist their prime customers, the linters dealers by:

1. Helping to keep the price of linters in line to meet the ever increasing competition by synthetics such as rubber and other by-products.

2. Another important factor is the quality of first cut linters.

Since high-grade first cut linters are urgently needed, the cooperation of the oil mill industry is requested to meet these requirements. Those mills now producing quality linters are happy with the results, but the quantity available yearly is inadequate to meet the demands.

USE OF LINTERS IN THE AUTOMOTIVE, BEDDING, PADDING, UPHOLSTERY AND RELATED INDUSTRIES

PART A

By

Glenn R. Green
F. Burkart Manufacturing Company
Division of Textron American, Inc.
St. Louis, Mo.

The consumers of linters in the padding industries can be broken down into three major classifications: the bedding industry, the furniture industry and the automotive industry.

The bedding industry is the largest consumer of nonchemical linters. Approximately 85% of the bedding manufacturers own their own garnetts, and they consume approximately 325,000 bales of linters per year. Of an estimated 1850 garnetts in the country, the bedding industry owns 1200.

The automotive industry is next in importance with an estimated 350 garnetts supplying this trade, and an annual consumption of 125,000 bales.

The furniture industry is the next largest consumer and an estimated 300 garnetts supply this trade with an annual consumption of 100,000 bales.

While a high percentage of mattress manufacturers own their garnetts, less than 1% of the furniture manufacturers own theirs, and only about 10% of the upholstered furniture produced comes from firms who own their own garnetts.

To be profitable, a garnetting operation has to be run around the clock. One garnett can make enough felt to fill from 7 to 10 mattresses per hour, and about 12 mattresses per hour can be manufactured on one assembly line. On the other hand one garnett can produce enough felt to upholster 20-25 pieces of furniture, while the average line can produce from 1-5 pieces per hour. Consequently, it is more economical for this trade to buy from what we call commercial felters.

USE OF LINTERS IN THE AUTOMOTIVE, BEDDING, PADDING, UPHOLSTERY AND RELATED INDUSTRIES

PART B

By

David Schimmel
Allen Industries, Inc.
Rahway, N. J.

Nineteen hundred and fifty was the year that almost knelled the death bell for linters and waste in automotive production. You will recall that during the latter part of 1950, first cut linters went up to 25, 26 and 27 cents per pound. The competitive items to linters were at least at the 25-cent level. We, the manufacturers of cotton felts for use in the automotive industry found ourselves in a very difficult position, inasmuch as we could not and dared not raise our prices to compensate for the increase in the price of the raw materials.

The rubber trend at that time was strong. We knew all the experiments that had been made at the River Rouge Plant, Fisher Experiment Plant and elsewhere, and that rubber from the point of view of service and seating comfort in an automobile was not as good as the products we were making. But we knew too that the sales departments of the various automobile companies were looking at that time for gimmicks and ideas to help sell their automobiles. Rubber offered a certain amount of romance and they seized on that idea.

I made a statement then and I make it today that I have never in all my experience seen a user of an automobile complain about the seating in his car to any great extent. I have heard them complain about the weak body, about the motor, about the body rattle, about the rear end and transmission but I have never heard anyone mention the fact that their seats broke down, that they had to get a new cushion installed in their car. The automobile people warned us at that time that if we raised our prices beyond a certain level that they would immediately go to the foam rubber people and make a deal. So during the latter part of 1950 and the early part of 1951 we cheated, all of us, every manufacturer of automobile batting cheated to the extent that they used inferior materials in order to meet a competitive situation.

If a situation like that ever comes up again, we know now that we will have to tell the automobile companies the truth. Most of us tried our best to maintain the highest possible quality, but the losses that were sustained were great. Changes were made here and there with the result that field complaints officially began to pour in. By the latter part of 1951, our supply markets had settled down a little and we were able to go back to our original specifications. Meantime, in 1952, those field complaints became serious regardless of what we produced for almost a year. The automobile companies then decided that in order to satisfy

their sales and engineering departments, that they would turn to rubber cushioning in the front and rear cushions of their automobiles. They continued to use cotton in the backs of the front and rear seats where there was no serious strain.

When they drew the body seat cloth over the seats, they found the rubber cushioning did not trim up, that there was a lot of loose fabric laying around on the seat, and that it became looser as the car was used. They then devised the method of using a very thin cotton pad over the top of the rubber.

Then they cameto another point. We had been using 60 percent mill run linters and 40 percent colored cotton waste to make what we call an insulating pad, a batting pad sewed to burlap, which was used on top of the spring. They decided then that they were going to use jute instead because jute effected greater savings to them. A polyethylene pad with saran cord running through it was sewed to the jute. At about that time too, support prices on cotton were going into effect and they were substantially high prices.

At that point a meeting was held in New York between the larger bedding manufacturers, as well as the automobile batt manufacturers to discuss the situation. It was decided at that time that we had to have a committee go to Washington to approach the Government concerning cotton prices. Another meeting was called in Memphis where we decided in conjunction with the National Cotton Council to form the National Cotton Batting Institute for the promotion of batting in bedding, upholstered furniture and automobiles. Strange as it may seem the automobile people that manufactured batting went along with it, although we knew there was no method of advertising that we could afford that would force the automobile folks to use cotton in place of rubber. That originates in the engineering department, and the engineer of various automobile companies had to make the decision, not us. However, we felt that by promoting the use of cotton-filled innerspring mattresses, bedding and upholstered furnishings, we would ultimately bring to the public's mind that cotton batting was a good item to use.

The National Cotton Batting Institute under the direction of the Cotton Council has done a magnificent job in the bedding field, the upholstered furniture field and the automobile field. Last week cotton was put back into Chevrolets. The other day Pontiac Division changed to cotton batting and we feel that Buick and Oldsmobile will go along very quickly. Mr. St.John of the National Cotton Council has been a tower of strength to us in promoting the use of cotton linters and wastes with a very, very small amount of money.

I know some of the problems that oil millers have today, but the most serious problem is to make a product out of cotton linters and cotton wastes that we can say is as good and in many cases better than rubber. We need color, character and staple. During the past few years we were able to get the character and color we wanted from cotton grown in California, Arizona and New Mexico. This year that cotton has been soft, making a pad that dies the moment someone sits on it. Years ago an engineer

at the Ford Motor Company devised a mixture, which he considered the right type of mix to make the right type of cushion, and which consisted of 60 percent first cut linters and 40 percent combers, picker and/or flock. That mix is still in effect--it has never been changed.

The Ford Motor Company recently established an inspection service throughout the country. They have devised methods for testing resiliency, and in order to pass the tests which the inspectors are putting on our padding, we've got to be extremely careful. If we get a bad reputation at this stage of the game, and if these inspection reports coming in from various assembly plants show that cotton takes a permenent set, we're licked not only in what we progressed in getting more cotton into, but we'll eventually be kicked out. So the character of the linters is the all important thing so far as I'm concerned. Color and staple play an important part, but the original reason why linters were included at 60 percent of the mix was because they gave a buoyancy that's needed in a cushion pad. Ford's inspection is just the beginning. Knowing the automobile people as well as I do, I'm sure that the other manufacturers will do the same.

A 10 to 12 million car year is in the not-too-distant future, so that the automotive market for cotton linters could grow to 200,000 bales if we continue to give them exactly what they want. We are willing to do anything in the world to cooperate in any way with New Orleans as far as showing you what we're making and why we have to have this character, or this color, or this staple. And if you're realistic, and if you really want a market to dispose of linters, the only way to do it is to make the character required by the various customers that you have. Certainly I'm sure that the oil companies are in the same position that Allen Industries are. We are working for more production, not less. We're looking for greater distribution of our products, not less. We're trying to improve our products, to create greater consumer demand rather than make an inferior product to find that after a few months of the year of trial and error that we're out and we have to think of something else.

DISCUSSION

Knapp: I think the statements made by Mr. Schimmel and Mr. Green are certainly very interesting and worth while. Both the cotton oil millers and linters consumers have a common problem. I can't help but feel that one missing link is a proper yardstick for the oil millers, the dealers, and the consumers particularly of first cut linters to use, so that they will be talking about the same yardstick. We have a grading system that's sponsored by the Government and which our company has used for a good many years and found worth while. It's not perfect by any means, and the Government is proposing to change the system this year. We don't know how the new system will work, and have been trying to get sample types so that we can apply the new grading system alongside the current one to see if it's any better.

When you consumers talk about the need for a certain quality of linters, the average oil miller doesn't quite know what you are talking about. Now when you say that you want a certain quality of first cuts, it would be desirable to talk of that in terms of grade. Let's say you want Grade 2-low. Then the oil miller can figure how much weight he can cut to make

that grade, and in a few minutes whether the price which you can pay and be in competition with your finished product will justify the mill making that grade at the price which you are willing to pay for it.

Until such time that you get a yardstick that the millers, consumers and dealers can understand, so that everyone is talking about the same thing, we will just go around in circles.

Stauffer: Mr. Knapp, you mentioned number 2-low linters. Could you make number 1 - middle linters today with the kind of seed you are getting?

Knapp: If you are talking about linters rated on the present grading system, I would say as far as our company is concerned it is practically an impossibility. I've seen us get to a point where we take off practically no linters at all and we still don't make that grade. About the best grade we can make is about a 2-high; and the prices for 2-high linters must be high in order to break even with making a 2-low or 3-high grade.

Schimmel: I think that Mr. Knapp's suggestion is an excellent one. Out of this symposium, I would like to see a committee formed of linters consumers and dealers, and oil millers, to reestablish linters grades and try to put them on a realistic basis. This committee could either work in Memphis, Atlanta, Washington, or wherever the most reasonable place would be.

R.Woodruff: Is character something that can be imparted to lint in a mill, or is it inherent to a very great extent?

Schimmel: In the 30 years during which I have been in the linter business, I was always under the impression that linters made in the southeast were soft, of good color and good fiber. Strange as it may seem, I've watched 20 or 30 cars from the Southeast that were just the contrary. They were better in character than a lot of linters that I could buy from the Valley, Arkansas, or certain parts of Texas. I don't know whether it is inherent or not. I do know that up until 1950 it was inherent with location. But not anymore.

R.Woodruff: You mean it can be destroyed but not necessarily built up in a mill.

Schimmel: That's right.

R.Woodruff: In addition to a set of standards for first cut linters, do we not also need a set of standards for second cut linters?

Knapp: I don't think that we have the problem of finding a yardstick that we can all understand for second cuts today as we have for first cuts.

Berkley: Mr. Schimmel, would you please elaborate on your statement that steaming of the seed injures the linters?

Schimmel: I don't believe steaming of the seed injures the linters, but I believe it ruins their character by taking out their resiliency. During steaming the injection of moisture in the linters fibers has a tendency to soften them, making them less resilient.

Berkley: When you dry the seed, the linters don't regain their resiliency?

Schimmel: I don't think so.

Spadaro: (In partial answer to Mr. Woodruff's question about whether the resiliency or character of linters is inherent or not.) One thing that I came across is what the oil mill can do to retain resiliency. It is my understanding that when linters are collected from the linter machine by the flue and beater method there is a chance to decrease the resiliency and harshness character of the linters fibers.

Schimmel: As far as we know, that is not true. A lot of people like to use the condenser method; however, the difference between it and the flue and beater method doesn't affect us as far as resiliency is concerned to any great extent--at least as far as I can see. Mr. Green might have some ideas.

Green: I believe that the more a fiber is worked over the poorer that fiber is. The closer you can get to a virgin fiber, the better the fiber is for our purposes.

Stauffer: I agree with Mr. Green.

Spadaro: I just want to say that my statement is based on talking to several people and not to any particular company. It is a general opinion.

Allen: For a long time over in the Southeast we made a great many linters and we got a good premium for them. We were told just this week by one of the prominent dealers that the trade as a class did not want condenser linters anymore. To answer Mr. Schimmel about linters character, one thing that has happened in the last few years in regard to the staple, resiliency and harshness of linters is that there has been a big change in the type of seed being planted.

Verdery: Do you gentlemen who have customers that prefer condenser lint find that you are netting more losses with the condenser lint?

Stauffer: Yes. However, we are willing to accept the loss in order to get better resiliency.

Verdery: I'm sure that if we find enough buyers that want it, and if the price would be right, we could give you what you want.

Green: Isn't the beater lint higher because you make money from beating the lint? Why give you a profit on the beatings if they have to go through our machine anyway? Doesn't the beating upgrade the lint?

Verdery: We have mechanical reasons for wanting to use beater lint. Most of the operators here know what that is. We think it makes a better installation, takes less horsepower, and we thought we were going to make better linters which I'm sure is definitely true on second cuts. On first cuts I've had some old friends in the linter-buying business that accused me of ruining lots of good first cut linters by getting off the condensers. Two representative people tell us they want the condenser lint. Maybe we should put some of them back in.

Knapp: I think one of the advantages of flue lint is uniformity.

RELATION OF SECOND CUT RAW LINTER PRICES TO SECOND CUT PULP PRICES

By

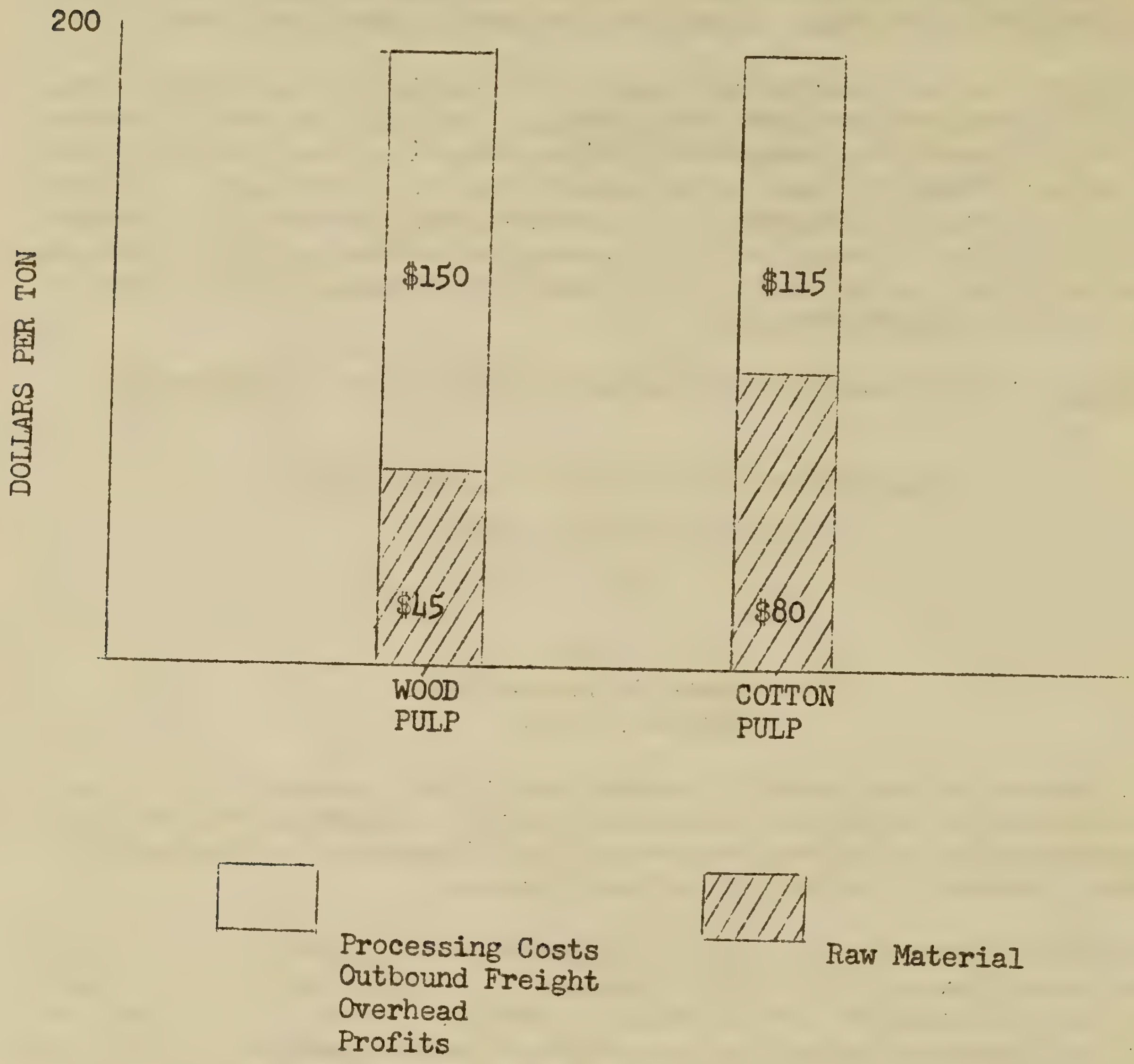
R. R. Milner
The Buckeye Cellulose Corp.
Memphis, Tenn.

In discussing the pricing of second cut cotton linters pulp, we would like to review the historical pricing of second cut linters, the production and consumption of cellulose, and some of the factors to be considered in the future pricing of second cut cotton linters.

In 1900 the cotton crop size was approximately 10,500,000 bales, but linters production was only 143,000 bales, or we might say that one bale of linters was produced for each 73 bales of cotton. Since 1900, linters production has increased rapidly in proportion to cotton production until last year when there was approximately one bale of linters for each nine bales of cotton. About 1920 the cotton linters bleaching industry was born to purify your by-product for resale to the rayon industry. In this function as bleachers we are working for you oil millers, processing one of your by-products into a purified form to be used by the chemical industry. In this status as a converter, the bleacher is the middle man and has not benefited by a higher end product price during the past years.

Since cotton linters are a source of alpha cellulose, the pricing of second cut linters has been determined by the fundamental and basic economic principle of supply and demand. Until recent years second cut cotton linters was the only source of raw material for a large number of end uses, such as cellulose acetate plastics and high quality films. During this period where second cut cotton linters held a quality advantage over competitive forms of cellulose, the price of cotton linters varied with the supply and demand of raw cotton linters as the wood cellulose supply was not an important factor in the pricing of linters pulp.

The price of finished wood pulp versus cotton pulp can be compared on the following chart:



These figures represent the price of wood pulp and cotton linters pulp for the last six months of 1955. Sales prices excluding the raw material leaves a cotton linters pulp producer with twenty-three percent less money for the four key items of processing costs, outbound freight, overhead and profit. (Profits are, of course, subject to income taxes.) In terms of cents per pound the raw linters price was $2\frac{1}{2}$ cents per pound, but due to freight, yield and cellulose premium these $2\frac{1}{2}$ cents per pound linters cost a pulp producer $80 for the quantity to produce a ton of finished pulp. It is evident from the above chart that it will be necessary for an increase in raw material costs of cotton pulp to be passed on to the end consumer in a higher-priced finished pulp. The law of supply and demand will continue to determine whether the end consumer will pay a higher cotton pulp price or purchase wood pulp.

From Department of Agriculture Marketing Research Report No. 56 we may review the historical comparison of price per pound of Grade 6 linters and linters pulp. The following chart shows a relatively constant spread since 1944 with the bleacher absorbing the increases in cost of labor and processing chemicals.

COMPARATIVE PRICE PER LB. OF GRADE 6 LINTERS AND LINTERS PULP, 1944,'47,'49, & '52

Year	Grade 6 Linters Cents/lb.	Linters Pulp Cents/lb.
1944	2.97	8.80
1947	7.75	16.30
1949	2.40	8.62
1952	5.96	14.40

The prices per pound in the next table tell the story of a fluctuating price of cotton pulp as compared to wood pulp.

COMPARATIVE PRICE PER LB. OF LINTERS PULP AND WOOD PULP HIGH TENACITY, 1944,'47,'49, & '52

Year	Linters Pulp Cents/lb.	Wood Pulp, High Tenacity Viscose Grade, Cents/lb.
1944	8.80	4.81
1947	16.30	7.44
1949	8.62	8.44
1952	14.40	9.75

It was difficult for the end consumer, such as a viscose tire cord producer, to plan his use of cotton linters pulp for production when his competitor was using wood pulp as a source of cellulose at half the cost. The raw material for dissolving wood pulp production has remained relatively stable throughout its history with a slow increase in price due to increases in labor, land transportation, and other costs affecting the growth and marketing of trees.

Cotton linters pulp throughout its history has been handicapped by its supply depending upon the size of the cotton crop, while the end consumer in acetate, rayon, or plastics must produce and market his product based upon the demand and not the cotton crop size. This factor of undependable and limited supply has been one of the key motivating factors in many of the end users switching to wood pulp as a source of cellulose supply.

The following table illustrates the growth of chemical cotton linters and dissolving wood pulp production since 1936:

U. S. PRODUCTION
(Thousands of Tons)

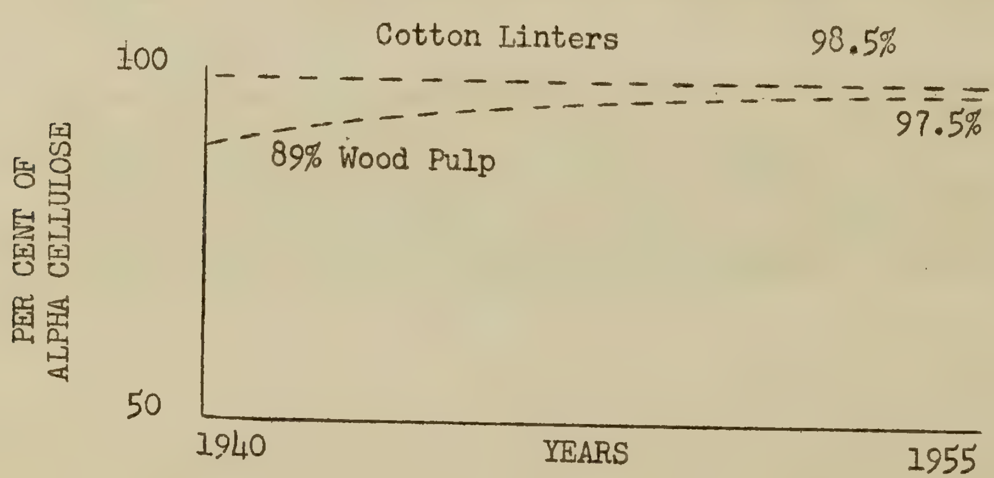
Year	Dissolving Wood Pulp	% of Total	Chemical Cotton	% of Total	Total
1936	199	72%	79	28%	278
1941	215	47%	239	53%	454
1946	280	65%	149	35%	430
1951	616	74%	215	26%	831
1955	1012	81%	233	19%	1245
		PREDICTION			
1959	1340	88%	180	12%	1520

The above production figures show that wood pulp is the major competitor of second cut linters for chemical cellulose use. It is predicted that chemical cotton cellulose will represent a maximum of 12% of the total cellulose business in 1959. The dissolving pulp prices of cotton linters pulp and wood pulp are now competitively priced, as it has become essential for cotton linters pulp to be priced competitively with wood pulp.

In the rayon industry alone the United States consumption of wood pulp has increased approximately 500% in the last twenty-five years. Cotton linters pulp represented approximately 50% of the pulp supplied to the rayon industry in the early 1930's. In 1954 about the same tonnage of cotton linters pulp was consumed as in 1930, representing less than 12 percent of the total pulp used in rayon.

Quality has been one of the major determining factors in the cellulose competition. Alpha cellulose is the principal quality factor in most end uses of cellulose, and wood pulp has improved in quality during the past fifteen years to where it is now approaching cotton linters, with cotton linters 98.5% alpha and wood pulp at 97.5% alpha.

As bleachers, we are devoting our research efforts to an improvement of cotton linters pulp for this competition in quality of cellulose.



In general the end use producers of the viscose industry prefer wood pulp over cotton linters because their processing costs are 10 to 20 dollars per ton cheaper for processing a ton of wood pulp as compared with cotton linters pulp. Wood pulp has inherent physical advantages over cotton linters pulp, which extend a competitive advantage to the viscose producer who uses wood pulp instead of cotton pulp.

The following table is a comparison of the end uses of cellulose, including both wood pulp and cotton linters pulp.

ESTIMATE U. S. AND CANADA DISSOLVING PULP CONSUMPTION BY MAJOR USES

Use	Estimate 1955 Total Consumption (Thousands of Tons)	% of Total Use
Viscose Rayon	513	45%
Cellophane	188	17%
Acetate	96	9%
Other	333	29%
Total	1130	100%

The largest percentage (45%) of dissolving pulp goes to the viscose rayon end use. The smallest percentage of pulp consumption is in the acetate business where approximately 9% of the business is acetate. It is estimated that cotton linters pulp comprises more than 50% of pulp consumed in the acetate industry.

Cotton linters are unable to compete with low cost wood pulps in the cellophane business but has retained a strong position in the tire cord business due to the added strength obtained from cotton linters over some wood pulpsnow in use. Laboratory tests now show that some wood pulps can produce tire cord yarn of strength equal to cotton linters pulp in these new processes.

The United States production of noncellulosic man-made fibers has increased at a rapid rate as illustrated in the following table:

U. S. PRODUCTION OF NONCELLULOSIC MAN-MADE FIBERS
(SOURCE, TEXTILE ORGANON, JANUARY 1956)

Year	Millions of Pounds
1950	146
1951	205
1952	256
1953	301
1954	346
1955	450
Capacity January 1956	560

As a matter of interest, it is estimated that in December, 1956, the world noncellulosic man-made fiber capacity will be 900,600,000 pounds or approximately 20% of the world production of rayon and acetate for the year 1954. This competitor in the man-made form is another reminder that we must continue to improve quality in cotton linters pulp.

With a limited cotton crop in the range of 12,000,000 bales as a future source of supply for United States second cut linters, it is important that we review the markets available for this form of cellulose that is limited in supply. It is our estimate that cotton linters pulp will retain the following markets for some time as the most desirable form of cellulose after wood pulp of equal quality is in use:

	Estimated Tons Annual Requirements Cotton Linters
Cellulose Acetate	45,000
Viscose	50,000
Miscellaneous	5,000
Total	100,000

There are new high quality wood pulps available that are equal to linters that will be in plant use some time this year. Any increase in the prices of cotton linters pulp over wood pulp will tend to create a movement away from linters pulp and possible permanent loss of markets for linters pulp.

To summarize:

(1) Raw second cut linters and linters pulp pricing will be determined by the fundamental law of supply and demand.

(2) Due to improvements in wood pulp quality, cotton linters is now just another form of cellulose competing with an unlimited supply of wood.

(3) Cotton linters pulp should retain its share of the market if the quality and price remain competitive with wood pulp. Bleachers have absorbed increases in costs of labor, processing, freight, chemicals, and research. Any increases in lint cost will have to be ultimately passed on to consumers, placing cotton pulp at a disadvantage.

(4) New uses should be developed for cotton linters pulp to assure its continued marketing as wood pulp takes over a larger portion of the viscose tire cord market.

All of us present at this meeting have one common goal and challenge to provide high quality cotton linters at competitive prices in the cellulose markets and to develop new uses for cotton linters.

PROCESSING PROBLEMS RELATED TO PRODUCTION OF LINTERS

Panel Discussion By:

Allen Smith, Moderator, Perkins Oil Co., Memphis, Tenn.
Redding Sims, National Blow-Pipe and Mfg. Co., New Orleans, La.
M. C. Verdery, Anderson, Clayton and Co., Houston, Texas.
Hal Harris, Planters Cotton Oil Co., Greenwood, Miss.
O. H. Sale, Fertilizer Equipment Sales Corp., Atlanta, Ga.

Verdery: We've continued to work on the problem of making cleaner linters and we are turning out quite a few new pneumatic devices, super-jets, and whirligigsbut nothing drastically new. I hope that Phillips and Bauer get that seed cleaner working pretty soon and make it a little easier on us.

Allen Smith: Mr. Sims, suppose you tell us what you have been building this past year, or some of the ideas that you have come across at the different mills that are working and helping the mill operators to produce a better and higher quality linters.

Sims: I'm not as familiar with the entire field problem as I used to be because I don't get around out in the country quite as much as I used to, but we've been doing our best to keep up with what is going on in the mills. I understand that three cleaners of the type which Allen Smith described at the 1954 Processing Clinic have been built. We have had trouble with a dust pocket in a linters flue system. The pocket consisted of first cut linters and developed because the linters were not being carried through fast enough. That condition was not as noticeable with second cut linters as with first cuts.

Harris: We are making clean second cut linters in the Delta now. This is being accomplished mostly by capacity in the lint room and in the cleaning room, and by several cleaning devices such as whirligigs and linter beaters. We are having a great deal of trouble with sticks in the Mississippi Delta now, but we will also try to overcome that problem by increasing our cleaning capacity. I believe the secret of making good clean linters is lots of cleaning capacity and lots of linter room capacity.

Sale: Mr. Brawner has asked me to bring some items of interest to you. Mr. Brawner's reaction is about in line with Mr. Harris', that if you have ample cleaning capacity you get clean linters. The answer, of course, is to clean seed before they get to the linters. He is putting as little as 35 tons of seed over one seed cleaner in order to do a cleaning job. The first of the seed in nearly all of his mills, due to storm damage and other factors, was really a problem; and by reducing the capacities of the seed cleaners and by adding more capacity by means of whirligigs and devices already mentioned, he has been able to produce acceptable linters in all his mills. His recommendation for a 120-ton per day mill is a large boll reel, which he is using, and fans and cleaners to handle all the fractions without any manual handling. With two Bauer Brothers 299 cleaners he has been doing a very nice job on 120 tons of seed. I think you'll find that is fairly well true all over the Southeast.

DISCUSSION

Allen Smith: We've been selling linters to Southern Chemical and enjoying somewhat of a better price for them. The way we are able to do that and cut more pounds per ton is that we converted 5 linters from third cuts to first cuts. We now have 15 linters on 141 saws making first cuts, 20 making second cuts, and 5 making third cuts. We are converting the second cut linters from 131 saws to 176 saws, and the third cut linters to 176 saws.

McClure: As most of you know, we have been using some first cut linters. We are primarily interested in cleanliness, and then fiber and color, in that order. We feel that the only place to clean the seed is at the oil mill. It cannot be done sufficiently at our plant. We spent about $250,000 on mechanical cleaning in the last four years. Every pound of linters that goes through our plant is mechanically precleaned, but nevertheless everything that you do at the present time plus everything that we do is nothing like what has to be done.

Verdery: Mr. McClure, is there any kind of trash that is of particular convern to you?

McClure: Sticks, stems, slivers of the stem, and the bark. Shales, hull particles and hull pepper are not a problem.

THE NEW FILTER TYPE SEED CLEANER

By

W. F. Phillips
Anderson, Clayton and Co., Inc.
Houston, Texas

This paper will describe the principle of operation of a newly developed type of seed cleaner, and will give some of the test results obtained from the operation of this machine. The new machine has facilities for suspending seed and trash in a moving current of air and then passing it in this suspended condition through a series of cylindrical rotary filters which remove first, the large trash and second, the fine trash. The movement of the air causes elongated material (sticks) and flat material (burrs, shale) to align themselves at right angles to the air flow, thus presenting their major dimensions to the square punched metal dressing of the first rotary filter. This trash is pressed against the filter by the air blast; and the rotary motion of the filter conveys the trash out of the machine. Conveying the trash out of the machine in this manner does not necessitate the trash moving relative to the screen as it must do in a shaker type cleaner. The second filter is dressed with 1/8"x 2" slotted metal. The seed and fine trash impinge upon this filter screen. Because of the suction existing behind the screen, the seed is in effect "vacuum cleaned" to effect fine trash removal.

The test results of a plant-sized model of this machine will be given and compared with the test results of shaker type cleaners operating in the same mill on the same type of cottonseed.

The paper will include slides showing diagrams of the machine and graphs of test results.

THE ARS DIFFERENTIATOR

By

L. L. Holzenthal
Southern Regional Research Laboratory

The status of work at the Southern Regional Research Laboratory as presented at the previous clinic meeting in 1955 was summarized. This included a report on the removal of foreign matter from cottonseed by projecting the mixture at high speed into still air. Three tests were described in which three 100-pound lots of seed having foreign matter contents of 2.9, 7.0 and 9.5 percent were projected, using a large size modified slingshot device. The floor pattern of seed and foreign material was divided into various fractions which were sampled and analyzed for their respective contents of foreign matter and for contents of nitrogen, oil and F.F.A. of oil in the seed and meats components, and the results correlated with distance projected in order to observe the various separation trends. The data substantiated findings previously reported on a smaller scale, i.e., (a) the bulk of the foreign matter travels a much shorter distance than the normally developed seed and tends to separate or collect relatively close to the projector, along with substantially all of the inferior and immature seed; (b) the seed that are projected further analyze higher in quality, i.e., higher in content of nitrogen and oil, and lower in percentage of F.F.A. in the oil; (c) the normally developed seed that are projected further, analyze lower in linters content.

The "ARS Differentiator," a continuous pilot-plant scale machine now under development by the Engineering and Development Section of the Laboratory was described. Principles of projection used in the handful-scale unit were incorporated into this machine.

A summary was presented of the results from the first four initial projection runs of the Differentiator with 200-pound samples of seed projected at 8,500 ft. per minute. Variables included: Feed rates 50 and 100 tons/day; opener peripheral speeds 1,000, 3,000, and 5,000 ft. per minute; dual belt clearance 8/64 and 12/64 inch, and seed foreign matter contents of 2.8 and 8.0 percent.

Data presented on the Differentiator included a table summarizing results on the extent of foreign matter removal in each of the four (4) runs and, for the run showing the most favorable trash removal, a tabulation and 4 separate curves. The tabulation showed variations in foreign matter contents and seed quality with distance projected for each of the fractions. The curves, based on the tabulation showed variations in contents of linters, foreign matter, nitrogen, oil, and F.F.A. in oil, with distance projected. The curves serve not only to evaluate the differentiator for

removal of foreign material, but show the approximate loss of valuable seed components corresponding to various levels of foreign matter removal.

WHERE DO WE GO FROM HERE?

By

E. A. Gastrock
Southern Regional Research Laboratory

It is certainly a pleasure to see the intense amount of interest that has been generated in this meeting and in the discussions and presentations that have been made. I believe it is an indication that the cottonseed oil millers, and the linters dealers and users have decided to do something definite to insure the successful utilization of linters. Many of the speakers have indicated that the potential for linters is greater than has been generally supposed. We've had encouraging results from the users of linters to indicate that many of the problems involving quality have either been solved or some indication of a solution has been shown. Several speakers stated that improved cleaning is a problem of the oil mills. I don't think the inference is that improved cleaning is a problem only of the oil mills, but at least the beginning can be made at the oil mills. A number of speakers and commentators believe top grade linters are needed.

A new vista has been opened to the group and this meeting would lose much of its benefit if we don't take the opportunity of translating the inspired words that have been spoken into some kind of action. If better testing methods for linters are needed, I think it behooves us to set in motion efforts to supply this need. Now I don't think the oil millers can do that alone, nor can the linters users do that alone. I am sure Dr. Fisher will say that the Laboratory will do anything it can in helping to define linters quality. This work would, of course, be done in cooperation with the Agricultural Marketing Service.

I'm deeply grateful for the response that we had from people to appear on this program. We had almost universal acceptance. This is the largest and up until this time the most enthusiastic of the five clinic meetings. The Southern Branch is always happy to have groups such as this meet here.

DEMONSTRATION OF ARS DIFFERENTIATOR IN PILOT PLANT

By

H.L.E. Vix
Southern Regional Research Laboratory

A demonstration of the ARS Differentiator for cleaning cottonseed was conducted in the Pilot Plant of the Laboratory. A brief description of the essential engineering features of this machine was given. Particular emphasis was put on the design and arrangement of the dual belts, the

clutch and transmission arrangement for obtaining high belt velocities, and the opener and feeder used to bring the cottonseed to the cleaning unit.

Cottonseed containing approximately 3 percent trash was projected at an initial velocity of 8,500 feet per minute. The group then had an opportunity to inspect the resulting floor pattern which clearly exhibited the performance of the machine. Representative samples of the seed (in section) as well as corresponding samples of trash from various distances of projection were shown to the group.

Considerable interest was evident in the use of this machine for the cleaning of cottonseed. Some interest was also expressed in the use of this machine for the grading of cottonseed for planting.

INTRODUCTORY STATEMENT

By

Ralph Woodruff
Research Committee Chairman, VOPA
Osceola Products Company
Osceola, Arkansas

Since five years ago when we first started planning the First Clinic, we gained a great deal of knowledge. The situation is entirely different now, and I want to say that I'm sure that it was the gentlemen who got together down here (managers, superintendents, technical men and laboratory folks) that helped us a great deal in our situation, and I'm sure they'll help you.

This convention would be welcome if we did nothing more than get together once a year to find out what was going on. I had no idea that first cut linters pulp compared so favorably with rag pulp; that we are beginning to regain and recover some ground that we lost to foam rubber in the automobile trade; and that in the paper industry there is a potential market for 500,000 bales of linters. I believe that we can make the kind of linters that these people need, that we should, because I don't think we can afford not to. If the bedding, batting and automobile people do not take our first cut linters, what are we going to do with them? Can we afford to do anything but make linters that will be competitive? I hope that you linters people will meet with us again and tell us more of what you are up against.

INTRODUCTORY STATEMENT

By

Allen Smith
Program Chairman, VOPA
Perkins Oil Company
Memphis, Tenn.

Another year of oil milling is history. Today we start our fifth consecutive year of discussions on how to better process cottonseed. This series of discussions, as you all know, is entitled "Cottonseed Processing Clinic." You may also know that the idea for this Clinic was conceived in the mind of the secretary for the "Valley Oilseed Processors' Association," Mr. C. E. Garner. Not unlike other proud parents, he wished to show or exhibit this brain child to others. He with others, later interested, came to the Southern Regional Research Laboratory for further study on how to bring up this child in the proper environment and surroundings. The whole cottonseed industry can be proud of the progress that is being made with the growth of this five year old child.

The fine spirit of cooperation shown by the officials and directors of the Southern Regional Research Laboratory in working with the Valley Association leaders is evident by your presence.

Speaking as your program chairman, it is with deep gratitude that I say thanks not only to those of you who are participating in the program but to all who have helped plan the program.

This year, just the same as all the others, Mr. Garner has written the letters, organized the program planning groups and with many of your helpful suggestions has come here today with an outline of topics that I am happy to introduce.

If there is no further announcement or suggestion, our fifth consecutive cottonseed processing clinic will start now by asking Messrs. J. H. Brawner, M. H. Fowler and Dr. F. A. Norris to lead in the discussion of "Unexplained Oil Losses in Processing Cottonseed."

SYMPOSIUM ON PROBLEMS AND PROGRESS IN OIL MILL PROCESSING

UNEXPLAINED OIL LOSSES IN PROCESSING COTTONSEED

Panel Discussion By:

J. H. Brawner, Moderator, Southern Cotton Oil Co., New Orleans, La.
M. H. Fowler, Buckeye Cellulose Corp., Cincinnati, Ohio.
F. A. Norris, Swift and Co., Chicago, Illinois.
Allen Smith, Perkins Oil Co., Memphis, Tennessee.

Brawner: Oil is a mixture and the analytical techniques we used in the past agreed well with mill operation. In recent years our methods of operation have changed a great deal and it is not surprising that we are bothered by such problems as unexplained oil losses. When we talk about unexplained oil losses, we mean that the analyses we have do not balance with the actual yields and results that we get.

Fowler: This report starts with the assumption that, under some conditions, part of the "total oil" by analysis is not accounted for either in the tank or in the meal by routine analysis. The thing we usually call "total oil" is the extract obtained in the Official NCPA method for grading cottonseed. Now, it is recognized that this extraction does not recover all the fat present in the seed. However, it is a reproducible method and a carefully calibrated empirical measure of the crude oil available to a hydraulic processor.

For many years we relied firmly on the fact that we could subtract the oil left in cake and huller room products from total oil in seed and get a reliable approximation of the mill yield. Many of you recognize this fact as a happy combination of errors. The extract from whole seed does not have the same composition as the extract from the cake or as the crude oil made because, in the cooking process, minor constituents of the seed are freed up for expressing and rendered soluble in petrolic ether.

Why then do we not get more oil in the tank than the chemist calculates? It seems we should get at least that amount represented by the difference in phosphalipid contents of whole seed extract and crude oil made. We believe the reason is that, while some fat may be freed in processing, about an equal amount is bound (physically or chemically) in the cake by processing and is rendered insoluble to the petrolic ether extraction. As long as we operated hydraulic presses we were well satisfied with the situation. Many laboratories made modifications and refinements to the analytical methods and got remarkably close agreement between actual and calculated yields. With the installation of expellers and screw presses it came as a shock to some of us that by the same analytical methods, same laboratories, samplers and accountants we were then getting appreciably less oil in the tank than the laboratory calculated.

Ignoring for now the many frantic and largely fruitless attempts to correct the trouble, I would like to tell you briefly the analytical results which suggest that the oil is not lost--only trapped in the cake. We first tried finer grinding and a few solvents and solvent mixtures to get all of the fat out of cottonseed cake. The amount of fat for which we were looking did not show up. Mr. W. J. Miller then suggested a new procedure. Mr. Miller's method consists of four separate steps.

1. Regular Butt tube extraction with petrolic ether.
2. Digestion of the meal residue from 1 in alcoholic potash to saponify the remaining lipids.
3. Acidulation of the slurry to release the fatty acid from the soaps formed in step 2.
4. Extraction of the fatty acid with ether.

This procedure is somewhat tedious and time-consuming because emulsions usually form in step 4, extraction of the acidulated slurry.

For convenience, the fatty acid recovered in this procedure is referred to as Petrolic Ether Insoluble (PEI) to distinguish it from the regular extract of cake or meal, Petrolic Ether Soluble. On a dry, hull-free basis expeller and screw press cakes so analyzed were found to contain about 3 to 5% PEI and hydraulic press cakes about 1.5 to 3.0%. Knowing that hydraulic mill yields in most instances check calculated yields closely, the PEI in hydraulic cake was used as a blank in some studies. The difference between PEI in expeller and hydraulic cake was referred to as "Excess PEI." It was found over last season that the

"Excess PEI" accounted for the difference between calculated and actual yields at two mills. We are continuing the analyses this season on three mills and a hydraulic mill for a blank.

The purpose in reporting these studies is to indicate that our customary analytical procedures are not adequate tools for studying unexplained oil losses in expeller and screw press operation. The method given in this report for recovering petrolic-ether-insoluble fat is not recommended for general application. It is suggested, however, that additional work in this field would be helpful to the industry.

Norris: We've had no particular unexplainable oil loss that I know of. There are two things that come to my mind in connection with oil losses. I remember one case in particular in a chemical process where we weighed-in the materials and weighed-out the final products and got a yield. Now in that particular case for a certain period of time, if we had calculated what we put in the plant on the basis of the products that were made we would have shown that we processed about 70 percent of what we actually processed, and the loss would not have shown up. So I think it is best to weigh-in everything that is put into a plant, and then if the product weight doesn't agree you really have something to get excited about.

The second thing that came to my mind was that the expellers are getting better, we are learning to cook better, and possibly we do something in the cooker or in the expeller that gives us low oil in the meal or in the cake, whichever you are talking about. We tried a few tests in which we saponified the fat to determine if we were losing oil in the cake or meal. We more or less got what we bargained for, although we knew the errors in the method were pretty sizeable and, of course, were looking for a relatively small amount. A series of experiments was begun based on the fact that fat determinations made by the official method on certain cereal grains indicated 1 or 2 percent fat because the fat was bound to protein or starch in the grain; and that by extracting the same material with alcohol, a polar solvent, evaporating the alcohol, and then extracting the residue with petroleum ether a fat content of 10 to 15 percent was determined. The fat was there, but it wasn't picked up with the official method.

So we wondered if this perhaps occurred in the expeller; that somehow the fat was tied up with protein or carbohydrate. So to check this we took a series of samples on whole meats feed to the cooker, meats coming out of the cooker, expeller cake and meal, and ran an official fat determination on them, and a determination using methyl alcohol, evaporating the alcohol and dissolving the residue with petroleum ether. On the whole meats or on meats through the cooker, the fat content by the unofficial method was slightly less than that by the official method; but on the expeller cake there was a sudden pronounced change. There was much more material soluble in the alcohol, and after evaporation of the alcohol there was about 60 percent more material soluble in petroleum ether than before. Those results mean that something happens when cottonseed meats go through an expeller that considerably changes the solubility of the constituents. More work would be needed to show exactly what it means beyond that.

Allen Smith: Most all of the data used in this report was supplied by some of the larger companies processing cottonseed. The information requested was as follows:

1. Average (a) % moisture, (b) % F.F.A. in seed received.
2. The number of pounds of oil either (a) above, (b) below the calculated or expected yield per ton.
3. The average (a) % F.F.A., (b) % refining loss in crude oil shipments.
4. Type of processing - (a) hydraulic, (b) expeller, (c) screw press, (d) solvent.

The purpose of this inquiry was to make a study of the data and try to find if there is a relation between the moisture in seed and the nearness that a mill approaches the calculated or expected yield to the refining loss of the crude oil produced.

This data covered a period of one, two, three and for one mill nine seasons of operation. The crude oil ranged from a low of 3.8% refining loss to 21.0%; the % F.F.A. from a low of 0.6% to a high of 6.9%. The difference in pounds of oil ranged from ten pounds more than calculated to twelve pounds less than calculated. The seed moisture covered a range from 6 to 14%.

The first attempt at arranging the information was to plot the difference between the actual yield and the calculated yield per ton against the X value of crude. The X value of crude is computed by subtracting the sum of three times the % F.F.A. content from the % refining loss. To determine the par or normal X value consider an oil having a F.F.A. content of 1.8% and refining loss of 9%. On this basis the seed (N.C.P.A.Rule) would not be discounted on oil quality, neither would the crude oil due to its refining loss. The par X value is 9 less three times 1.8 or 3.6.

Oil refinings with an X value of 3 and higher produce in most instances a rough soap stock. The higher the X value, the rougher is the soap stock with increasing neutral oil content. As the X value becomes lower the soap stock becomes smoother and contains less neutral oil. A degummed oil will refine, in some cases, to a negative X value. Soap stock from degummed oil is different from crude oil soap stock both in color and physical characteristics.

As mentioned above all information was put on graph paper. At first this was done without regard to the moisture content of the seed. The results are as follows:

I. For hydraulic mills with seventy-three (73) mills reporting--twenty-seven (27) or 37% reported as having made more oil than the calculated amount. Eight (8) or 9% reported as having made the exact amount calculated. The other thirty-eight (38) or 52% reported as having made less oil than expected. Of the whole group thirty-seven (37) or 51% reported within plus or minus two (2) pounds of calculated yield.

II. For screw press and/or expeller mills forty-one (41) reported. Eleven (11) or 26.8% reported as having made more oil than calculated. One (1) or 2.4% reported as having made the exact calculated amount. The other twenty-nine (29) or 70.7% reported as having made less oil than expected. Of the whole group twelve (12) or $29\frac{1}{4}$% reported as having made within the limits of plus or minus two (2) pounds of the calculated oil yield.

III. Fourteen (14) solvent mills reported with 50% above and 50% below calculated yields. However, eleven (11) mills or 78.6% reported within the limits of plus or minus two (2) pounds of the calculated amount.

The second arrangement of the data was according to the moisture in the seed milled. The table below is a summation where the plus and minus pounds of oil yield per ton were added in order to arrive at an average figure for a given moisture content. The average X value for each moisture level is also reported. From this table, note the net pounds of oil difference with its corresponding X value. The X value may be expressed in terms of pounds of oil per ton. In this study no doubt the pounds of oil yield per ton will vary from 300 for hydraulic to 350 for screw press. At ten (10) cents per pound for crude oil, one percent premium would also vary from thirty (30) cents to thirty-five (35) cents. This expressed in terms of one percent refining loss would be 22½ cents to 26¼ cents or an average of approximately 24 cents. From this we arrive at the X value of one point, an X value which would equal to 2.4 pounds of crude oil. On this basis of comparison a mill producing the same amount of oil as calculated and having an X value of 3.6 points (par value) could be used in determining the most efficient operating procedure.

The following graph shows the relative values of mill operation at different seed moisture content. It indicates the degree of efficiency at which the mill is operating when compared to the laboratory reports.

% Moisture Range in Seed	Number of Mills Reported: Hyd-	Number of Mills Reported: S P or & Exp.	Average Pounds Oil Difference Act. vs. Cal.: Hyd-	Average Pounds Oil Difference Act. vs. Cal.: S P or Exp.	X Value Average: Hyd-	X Value Average: S P or Exp.	Net Value (¢) in Terms of Oil Per Ton @ 10¢ Lb.: Hyd-	Net Value (¢) in Terms of Oil Per Ton @ 10¢ Lb.: S P or Exp.
13.1 - 14.0	3	X	+1.17	X	2.93	X	+27.8	X
12.1 - 13.0	7	X	+1.64	X	2.64	X	+39.4	X
11.1 - 12.0	3	3	-2.5	+2	2.16	4.63	+10.0	-4.7
10.1 - 11.0	4	7	-1.5	-6.12	2.37	2.93	+14.5	-45.1
9.1 - 10.0	13	9	-2.58	-3.26	3.11	3.47	-14.0	-29.5
8.1 - 9.0	8	10	-2.50	-3.52	3.16	3.75	-14.0	-38.8
7.1 - 8.0	7	4	+0.11	+3.55	3.94	3.15	+16.9	+46.3
6.1 - 7.0	4	X	+0.75	X	X	X	+14.7	X

DISCUSSION

Brawner: It seems to me that one of our problems is that we have changed our method of processing, and our analytical techniques that were good years ago don't quite fit what we're doing any more. Is there anyone here from any of the commercial laboratories or from the Southern Regional Laboratory who would like to say something about this?

Mays: I don't quite follow the idea of trying to correct this situation by changing the method, when some millers are admittedly recovering the oil. I think we must find out more about what is causing the trouble. Some mills are not having it. This trouble has been going on for a long time and I think it has been accepted more or less as sampling errors. I would like to have the analytical technique which Dr. Fowler and Mr. Norris used and I promise to do some work on the details of the method.

Woodruff: Do you think there might be something in the seed in one given year for some reason, climatic or otherwise, to which this trouble might be attributed?

Brawner: I think it is a risk.

Spadaro: In the work that was done by us on the exhaustive extraction of cottonseed, we encountered what the oil mills did. It was necessary to make an actual balance between the starting material and the end products, and all of the ingredients in the crude oil had to be determined. As a result of that, another study was started by Paul Eaves and Laurie Molaison which determined that the crude oil in will not balance the crude oil out, but the neutral oil content of the initial material and that of the end product will balance closely. There is a possibility that some of the non-lipide components will combine with the meal in cooking. We did this with cooked and uncooked materials. With the uncooked material the balance was pretty close, but with the cooked material the crude lipides did not balance; in all cases the neutral oil balance was close.

Brawner: Did you find any indication that there was any oil oxidation or any possibility of a similar loss?

Spadaro: I don't think we got quite that far. Paul, can you add anything to that?

Eaves: We were surprised to find that when you analyze the oil from raw meats, that the material determined as oxidized fatty acid content was actually higher than in the oil from cooked meats. That will be shown, I think, in the data on the lipides we extracted from those materials, and we attributed that chiefly to the fact that from raw meats you are extracting a lot of stuff which is not oil--phosphalipides, gossypol and gunk is the only term I can use to describe it. It couldn't be accounted for in the material balance, whereas the neutral oils could be accounted for from start to finish. In other words, there was less than 1/10 of a % difference in yield of neutral oil from raw oil and thoroughly cooked and tempered materials. There possibly is a difference in seed from one year to another but that is something that I think would be pretty hard to pin down. There is a difference in variety of seed. We worked on some seed from El Paso, Texas, a high water content seed and we worked on seed from the valley from around Greenwood. We found that we could get a little more oil out of the higher water content seed than was indicated. We obtained more by hexane extraction than was indicated by the petroleum ether analysis. On the Greenwood seed, the oil checked very closely.

Woodruff: Will a high oil content seed establish that you may get a better recovery?

Eaves: That appears to be the case.

Kidd: Mr. Brawner, you mentioned cake and hulls in calculating your oil yield. You don't consider your meal?

Brawner: In our mills we use the meal in calculating oil yields.

Kidd: Do you calculate the oil in your linters?

Brawner: No we don't and that is where we are inaccurate.

Kidd: How about the flue bran in the lint flue system.

Brawner: Yes, we do that.

Kidd: How about the gravel and motes?

Brawner: No.

Kidd: Well, there is a good little bit there.

Brawner: That is right. There is a loss there.

Kidd: I think each mill operates differently and has different quantities of those materials mentioned. If you have a complete analysis made on all of them and weigh them accurately, I think the analytical methods would work out perfectly. In Birmingham we found that we were losing a lot of oil in hull fiber and in linters.

Stansbury: We shouldn't forget the importance of moisture. Moisture is an empirical determination in itself, and you must be sure that you have the proper moisture relationship that should go in these materials balances.

Brawner: What Mr. Stansbury is talking about is that if you are not very careful in handling your samples that what you think is the oil content of a ton of seed may be the oil content of something less or something more, depending upon how the moisture change takes place in your sample.

Fowler: I wonder if the Southern Regional people would be interested in applying the techniques of exhaustive extraction to the expeller operation.

Gastrock: I think so. However, I don't see how easy it is going to be. We might have to start with a cake somewhat less than completely extracted in the expeller and then apply exhaustive extraction to that by the solvent method; or we might have to prepare a cake that is expressed to different degrees. It is going to be a far more complicated procedure than by solvent extraction.

Fowler: What I had in mind was starting with seed to an expeller mill and working a neutral oil balance with those techniques that were described all the way through the cake.

Spadaro: We had to construct a special laboratory cooker, assimilate the hydraulic cooking conditions in the mills, whereas it would be almost impossible for us to do that with screw pressing. We don't have any small laboratory screw press to assimilate the conditions in your mill, and after we make the balance, we wouldn't really have the right answer.

Fowler: We'll send you all the samples from one end to the other.

Spadaro: We can make the analytical tests on it, but in addition we must have a complete weight balance all the way through. As somebody pointed out you are looking for only 4 or 5 pounds of oil per ton of seed and you must have a mighty good analytical balance. We have a man here who has done a very good job. Mr. L. Molaison is a very good analytical technician and that was required for the good balance.

USE OF PRESSURE-LEAF FILTERS IN FILTRATION OF SCREW PRESS OIL

By

R. T. Grimm
Niagara Filters Division
American Machine and Metals, Inc.
East Moline, Illinois

The Niagara horizontal style pressure-leaf filter, first introduced to the vegetable oil industry in 1951 has been successfully applied to the removal of foots from crude linseed and copra oil. This same filter has recently been tested and proven under actual mill operating conditions on pre-screened cottonseed oil from mechanical screw presses. In cooperation with Perkins Oil Company, Memphis, Tennessee, the test work was conducted on a small production-size filter which was placed in almost continuous service for a period of three months. The filter consisted of a horizontal cylindrical pressure tank enclosing a battery of vertical filter elements mounted on a retractable carriage.

Using no filter media other than a woven wire cloth to retain the foots particles, the tests indicated that this filter can produce a filtered oil equal in quality to that obtained from conventional presses dressed with both cloth and paper. Air blowing time to reduce the residual oil content of the foots cake was reduced markedly over that normally required on presses.

Design features of the filter allow simple one-man operation since the operator has complete access to all of the filter cake when the unit is ready for cleaning. Cake discharge time is a matter of minutes on a large production size filter. Other features include totally enclosed operation, better housekeeping, reduced downtime and elimination of leakage. In addition to the advantages indicated above, the economics for installation in an average mill are favorable with considerable savings resulting in reduced labor and complete elimination of filter cloths and paper.

DISCUSSION

George: Was there any difference in refining loss noted between the two types of filters?

Grimm: There was no difference noted in the refining loss when using the Niagara as compared to the recess plate type.

George: Were there any definite checks made? In other words, were samples taken and analyzed in each case?

Hammes: We did not run the oil through the recess plate and the Niagara at the same time. We were primarily trying to determine the flow rate and the clarity of the oil. So far as refining loss difference, we didn't notice any.

IMPROVEMENTS IN EXPELLER OPERATIONS

By

T. S. Pryor
South Texas Cotton Oil Co.
Corpus Christi, Texas

During the past four or five years there has been a general trend towards high speed or high capacity operation of both expellers and screw presses, and from observing results obtained at a number of recent installations, we know that we may now plan to press on either make of machine the meats from 45 to 50 tons of cottonseed a day.

At these tonnages we may expect to get nearly as good or better extraction than we did on the slow speed machines, to make a bright colored meal, and to make an oil which approximates that made on hydraulic presses.

I should like to describe briefly the cooking and pressing equipment at several mills using high speed expellers and screw presses, to show the results they are getting, and to discuss the factors which are important in this type of operation. Table No. 1 gives a description of the presses and cooking equipment at four mills, and Tables No. 2 and No. 3 show the results being obtained with this equipment.

Table No. 1 - Description of Cooking and Pressing Equipment at Four High Speed Installations

Mill	Type of Presses	Motor HP Each Press	Shaft Speeds	Conditioner	Cooker
A	2 Anderson Expellers	40 HP Vert. 40 HP Horz.	85 RPM Vert. 45 RPM Horz.	1 14" Conditioner on Each Expeller	1 5 High 85" for Two Expellers
B	1 Anderson Expeller	40 HP Vert. 60 HP Horz.	104 " Vert. 52 " Horz.	1 14" Conditioner on Each Expeller	1 5 High 85" for 1 Expeller
C	2 French Screw Presses, 22" Ext.	100 HP	42 RPM on Main Shaft	None	1 6 High 85" for 2 Screw Presses
D	6 French Screw Presses, 22" Ext.	100 HP	45 RPM on Main Shaft	None	1 5 High 85" for 2 Screw Presses

Table No. 2 - Typical Operating Results for Installation Described in Table No. 1

Mill	Seed Crushed per 24 Hrs. Per Press and Calculated Cake Wts.	Seed Analyses H_2O %	Seed Oil %	Seed NH_3 %	Seed FFA %	Cake Analyses H_2O %	Cake Oil %	Cake NH_3 %	Meal Analyses H_2O %	Meal Oil %	Meal NH_3 %
A	45 Tons Seed Per Day (1548 Lbs. Cake/Hr.)	7.6	17.2	4.18	0.88	2.41	3.37	9.62	8.40	2.88	7.93
B	50 Tons Seed Per Day (1689 Lbs. Cake/Hr.)	10.1	18.6	4.05	2.74	4.86	3.67	9.49	6.32	3.08	7.06
C	37.5 - 40 Tons Seed Per Day (1440-1536 Lbs. Cake/Hr.)	10.5	19.6	3.99	---	3.78	2.77	8.22	6.22	2.78	7.96
D	45 Tons Seed Per Day (1492 Lbs. Cake/Hr.)	9.8	18.9	4.04	0.6	2.26	3.52	9.64	6.83	3.15	7.96

(The above analyses represent an average for a 3 to 4 week period)

Table No. 3 - Typical Oil Analyses for High Speed Installations

Mill	FFA - %	Refining Loss - %	Color	Bleach
A (Season's Av.)	.995	6.08	5.91	2.15
D (Av. 30 Cars)	.74	5.6	5.58	1.63

USE OF MOISTURE METER

By

L. H. Hodges
Barrow-Agee Laboratories, Inc.
Memphis, Tenn.

Since the beginning of cottonseed processing, the moisture content has been recognized as an important factor in milling efficiency.

The cleaning machinery, delinting equipment, and hullers all perform best under certain moisture conditions. Under those which differ from the optimum, compensation must be made in either speeds or tonnage in order to obtain the highest efficiency.

The value of an optimum moisture is clearly recognized at the flaking rolls, for without sufficient moisture, flaking to the desired thickness may not be accomplished.

When the hydraulic press was the predominating type of equipment, the meal cook or press room foreman was usually experienced enough to be able to "feel" the cooked meats, be alert for crawl of cake in the presses when it became too wet, and for dry-end cake when the moisture was too low. By such visual observation, it is reasonable to expect the moisture range, between the low and high, amounted to several percent.

The percentage of moisture in cake took on technical significance as a result of the research conducted by the University of Tennessee during the years 1949-1952. The results of that investigation were reported to the Clinic at its second annual meeting by G. H. Hickox.

With the transition from hydraulic presses to continuous presses and solvent extraction came the need for more accurate methods of determining moisture, for in these newer processes, moisture control is regarded as a prime factor in obtaining utmost efficiency in oil extraction. Linked closely to this is the oil quality and amount of foots produced. From the analytical data accumulated by both of the leading manufacturers of continuous presses, it is obvious that moisture should be controlled within relatively narrow limits beginning at the rolls and during cooking. Being confronted with this necessity, several mills requested recommendation of a quick, on-the-spot method for determining moisture. This resulted in our investigation of several makes and types of instruments for this purpose.

The factors to be considered were accuracy, application, ease of operation, ruggedness, and cost. With these in mind, we selected an instrument which we believe contains all the desirable features. Its

accuracy for all practical purposes was checked against official methods. Its range is from 0 to 100%, which is made possible through evaporation of the actual moisture by infrared radiation.

Its ease of operation is best demonstrated by the fact that most mills to whom we have supplied this instrument have the press room operator make the tests at periodic intervals. There are no calculations or temperature conversions as the dial reading, when balanced, is the percentage of moisture.

Although there are other instruments capable of giving accurate results, we believe this is one of the most nominally priced on the market.

Satisfying ourselves as to qualities of the instrument, we recommended it to the various mills and to the representatives of the V. D. Anderson Company and French Oil Mill Machinery Company. Many are now in use in the press room and in solvent plants. Undoubtedly, by their use, they have repaid their cost many times through increased efficiency.

I have brought one along for your inspection, and will be glad to demonstrate its operation and answer any questions you have concerning it.

DISCUSSION

Kidd: Mr. Pryor, you mentioned that Mill A was carrying 100 percent full load on a 240 horsepower motor, can you say what percentage of full load is on 100 horsepower motor in Mill C?

Pryor: Possibly Mr. Burner could tell us.

Burner: I am not exactly sure but the percentage of load on the 100 horsepower motor in Mill C is probably somewhere about 85 or 90%.

Kidd: Mr. Burner, will you please comment on the difference in oil content of the seeds, in the ammonia in the cake, and the possibility of what Mill C would do on the higher ammonia cake and what tonnage would come out at the 42 rpm speed.

Burner: Several people have expressed the idea that maybe we should be looking at the total percentage of oil that is recovered by the expeller or screw press instead of the percentage of oil that is left in the cake or meal. I'm not sure just how the total oil content of the material being worked would affect the efficiency of the machine. I feel sure that Mill C would be able to work considerably more tonnage with the same efficiency, or to work the same tonnage with greater efficiency if high rather than low protein cake were being processed.

Norris: To what extent would the moisture meter reading differ from the official method when you're operating with a screw expeller in a range of 2.5 to 3.5 percent?

Hodges: The machine is graduated at 0.2 percent. I would say that you would approach the results of the official method within 0.2 to 0.4 percent.

Smith: How long does it take to make a determination?

Hodges: The length of time depends on the particle size of the material. The finer the material is ground the shorter is the time needed. The amount of moisture in the material is also a consideration. A determination on expeller cake takes about 4-4½ minutes provided there is a full voltage of 110 to 120 volts.

Norris: Could you take a sample directly from the bottom of your cooker and determine a moisture with the amount of flashing that would take place?

Hodges: You would have flashing, but you would be using the instrument only as a guide to determine what you should be able to do. You would possibly have a flash of as much as one-half percent or more, depending on the time that it would take to get the sample from the cooker to the instrument.

Pryor: We've used the Cenco moisture balance in our mills for a couple of years. When we first began using the machine, we ran duplicate samples of a number of different materials on the machine, and sent them in an enclosed container to a laboratory. At that time I found that on unrolled or rolled meats, or on cooked meats that 7-minute determination would give a fairly close figure for the moisture. In the case of ground meal, we normally use about 4 minutes.

PROCESSING TO MINIMIZE INITIAL REFINED OIL COLOR AND REVERTED COLOR IN COTTONSEED OIL

By

H. D. Fincher
Anderson, Clayton and Co.
Houston, Texas

To produce oils of low initial refined color some control must be exercised over the amount and type of pigments entering the oil. This control begins with storage of seed under conditions which do not favor the formation of products causing color reversion. Further control is obtained by adjusting the several processing variables to minimize the amount of pigments dissolved in the oil and to prevent or minimize the formation of reversion products.

Color reversion after the oil has been extracted is attributed to the presence of gossypol or its derivatives. The degree of reversion and tendency to revert depend on the amount of these pigments present. The amount of these materials finding their way into the oil is minimized by control of moisture, temperature and time so that most of the pigment glands are ruptured in the early stages of processing. Rupture of the glands with release of gossypol at this point favors having the pigment remain with the meal rather than going with the oil.

Color reversion depends on one or more chemical reactions involving the pigments and can be retarded by storage of oil at low temperatures. Reversion is arrested when refining or other procedures are used to remove gossypol and its derivatives from the oil.

DISCUSSION

Newby: It isn't the color per se which is hurting cottonseed oil in the United States oil market today, but the bleachability or ease of removal of that color.

Fincher: That is exactly correct. The finished processor of the oil is not interested at all in the refined product, but in the bleached product. The pigment formed as I recovered it is difficult to remove by bleaching as well as by refining.

Norris: Would you say that alkali cooking is good for reversion on the basis of work that the Regional Laboratory has done?

Fincher: In our work we conducted plant scale operations in which we were unable to go to the moistures that the Regional Laboratory did in their laboratory operation. In their tests they have used moistures above 22% and have prevented gossypol from going into the oil. Hence they don't have any reversion.

EXHAUSTIVE EXTRACTION OF COTTONSEED - QUALITY AND ECONOMIC CONSIDERATIONS

By

P. H. Eaves, A. J. Crovetto, J. J. Spadaro, E. L. D'Aquin, C. L. Hoffpauir, M. F. Stansbury, and V. O. Cirino
Southern Regional Research Laboratory

Fractional portions of the total crude lipides of the whole meats of two types of cottonseed, prepared for extraction by simple flaking of raw meats, by tempering, and by cooking, were produced by means of successive stepwise extractions designed to obtain the lipides fractions in the order of the difficulty of their extraction. The extraction solvent was hexane and the extractions were conducted at approximately 120°F. From 3 to 5 crude lipides fractions were produced from each batch of prepared meats, the first fraction comprising 93% to 95% of the lipides, with the remaining 2 to 4 fractions bringing the total crude lipides extraction up to about 99%, equivalent to residual lipides of from 0.31 to 0.68 on a moisture free basis. The successively extracted fractions of the total lipides were quantitatively isolated and their proximate compositions determined.

It was found that the composition of the successively extracted lipides fractions varied with the degree of total lipides extraction, the lipides by more exhaustive extraction containing greater amounts of impurities and lesser amounts of neutral oil. It was also found that the method used in preparing the meats for extraction was of paramount importance in its effect on the composition of the crude lipides, the lipides fractions from the raw and tempered meats being substantially higher in impurities and lower in neutral oil throughout than the corresponding fractions from cooked meats.

Crude oils equivalent to varying degrees of total lipides extraction were reconstituted from the crude lipides fractions. These crude oils were subjected to conventional refining loss and refined oil color tests and their quality and value determined on the basis of these tests in accordance with the rules of the National Cottonseed Products Association. It was found that both refining losses and refined oil colors tended to increase with increasing degree of total oil extraction. Refining losses of the oils from the cooked meats were of a very low order as compared to those of the oils from raw and tempered meats and increased only slightly as the degree of total lipides extraction increased.

The "percent" value, or value per unit of oil expressed as a percentage of the contract price, generally tended to decrease with increasing degree of extraction. The decreases were substantial for the oils from raw and tempered meats but were negligible for the oils from the cooked meats.

The dollar value of the oils obtainable from the differently prepared meats from one ton of each of the two types of seed at various degrees of total oil extraction were computed on the basis of a contract price of 15 cents per pound for the oil. It was found that the general trend was for the dollar value of the oil to increase with increasing degree of total oil extraction, the increase in oil yield by more exhaustive extraction more than compensating for the lower "percent" values of the oils obtained by more exhaustive extraction. The oils extracted from cooked meats proved to be highest in dollar value after about 95% to 96% of total lipides extraction.

DISCUSSION

Verdery: What is the real objective of this work?

Eaves: A good number of the mills have switched to the solvent extraction process primarily to get more oil. We have been asked if possibly carrying the extraction further by the solvent extraction method wasn't contributing to the oil color trouble in that phosphatides, gossypol and gunk were being extracted also. It was to answer this question that we did this work.

Verdery: What have you concluded regarding the effects of proper cooking?

Eaves: If the meats are cooked properly, you will not extract a lot of the material that you would after a less severe or less thorough cooking. So it will not have to be refined out. Why extract these materials if you can't sell them and if they increase the refining loss and refined color of the oil, which values have a definite bearing on oil price.

Verdery: You proved an interesting point there. Were the conditioned meats rolled?

Eaves: They were first cracked, then tempered, and while they were still warm, they were rolled.

Stokes: Would you clarify the difference between the two types of conditioning again, please?

Eaves: In tempering, we cracked the whole meats, fed them to the top ring of a 5-high cooker, increased their moisture content to about 12%, and heated them up to from 105 to 107°F. before we removed them. Then they were dumped out and flaked. That tempering process was the nearest we could come to the filtration-extraction cooking method, which I believe to be an improvement over the hydraulic press cooking method. In the filtration-extraction cooking method the meats were flaked, fed to the top ring of the cooker, their moisture increased to 21%, and they were cooked for approximately 50 minutes to a maximum temperature of about 212° - 215°F. They were then discharged from the cooker, screened to break up any lumps that were formed, and spread on trays to permit excess moisture to flash off by evaporation. So that when we finally charged the cooked meats to the extractor, they had about 13% moisture.

Stokes: Were there any differences in time before the samples were refined? I am thinking of color reversion.

Eaves: There were some differences in time, but as rapidly as the oil fractions were produced they were placed in cold storage and kept at a temperature below freezing to inhibit or prevent reversion. Just as soon as the oils were reconstituted, they were refined either the same day or the next.

Fincher: Did you sample or extract phosphatides to determine if there was any difference in the characteristics of those obtained from raw meats and of those from tempered meats?

Eaves: No we did not. We simply analyzed the oil for phosphorous and multiplied the phosphorous content by 25. What we were actually after was a means of comparing phosphatide content and we didn't obtain the phosphatides as such.

VARIATIONS IN CHEMICAL CHARACTERISTICS AND NUTRITIVE VALUE OF COMMERCIAL COTTONSEED MEALS

By
A. M. Altschul
Southern Regional Research Laboratory

The purpose of this discussion is to present a brief review of what we are doing in trying to improve the nutritive value of cottonseed meal for poultry and swine. I will mention only briefly several other lines of work. We are conducting research, in cooperation with the Engineering and Development and the Analytical and Physical Sections, on development of new approaches to cooking of cottonseed to yield higher quality oil and meal. This is an outgrowth of laboratory work which indicated that cooking of cottonseed at high moisture contents and with the addition of alkali seems to improve both the oil and the meal. Other work is on improving the color of cottonseed oil by studying the reactions of gossypol in the oil and the development of pigmented materials on storage. The subjects which I will discuss in greater detail are our study of commercial cottonseed meals in cooperation with the National Cottonseed Products Association and our work on developing better chemical methods of characterizing the nutritive value of cottonseed meals, also in cooperation with the VOPA.

Considerable progress has been made in understanding the processing variables which affect meal quality, and many meals suitable for feeding to poultry and swine have been produced. Indeed, in 1954, it is estimated that approximately 250 thousand tons of cottonseed meal went into poultry and swine markets. With all this background of progress, the time had come to take stock of the present processing of cottonseed to compare the relative merits of meals produced by the various commercial processes. Accordingly, plans were made for collection of typical meals made by the various methods of processing and their evaluation in a standard nutritional test to be conducted by a number of laboratories, Federal, State and commercial. A Fellow of the National Cottonseed Products Association, Mr. Biagio Piccolo, was assigned to assist in carrying out this experiment. Close to 50 commercial meals were analyzed and then typical meals of the various classes were selected. There will be included 3 screw-press meals representing light, medium, and extreme processing conditions. There will be 2 prepress solvent extraction meals representing two levels of intensity of processing. There will also be a straight solvent-extracted meal, a hydraulic press meal, and a chemically-degossypolized meal. All these meals are now being collected. The diets containing these meals will be mixed in one operation through the help of the Ralston-Purina Company. The mixed feeds will be sent to nutrition investigators during the month of April.

Complete chemical data are being taken on all of the meals so that there will be ample opportunity for correlation between chemical properties and nutritive value. The Soybean Research Committee is cooperating by providing a standard soybean meal to be used as a comparison in many of the experiments, and in mixture with cottonseed meal in various proportions in all of the experiments.

The results of this investigation, which will take a year or so to assemble, should have a profound influence on the pattern of use of cottonseed meal in the future and may affect the future of various processing techniques as it indicates those which produce meals of superior quality and enhance economic value.

Nitrogen solubility in dilute alkali is now being used to measure the extent of heat damage suffered by the meal during processing. This is a very useful criterion. In an attempt to improve upon it so that the results of different processing conditions can be assessed, considerable research work is being done on the chemical properties of cottonseed meals. This work has the further value of finding what actually happens chemically to meals produced by different methods of processing. Such information might well serve as the clue for the development of improved methods of processing.

One of the outcomes of this investigation has been finding that solubility in strong acid parallels the results of solubility in dilute alkali and in many instances gives a more accurate representation of processing history. It is not proposed that solubility in acid should substitute or supplant the present use of solubility in alkali. Both suffer from the fact that they are empirical measures.

We have the feeling as we look upon our program at the present time that by virtue of closer chemical examination of the meals we are coming closer to an understanding of actually what is happening during processing. We have the feeling that we should shortly be able to understand why meals differ in their nutritive value as a result of processing conditions, and how one process differs from the other in its effect on the meals. This basic information should take us out of the class of operating in the dark and make it possible to apply chemical information to the planning of processing programs with the ultimate aim of producing meals of improved nutritive value and higher economic value.

DISCUSSION

Stokes: Is there any definite relationship between nutritive value and nitrogen solubility below 55 percent nitrogen solubility?

Altschul: If you want a correlation between 30 and 40, and 40 and 50, I can't give you a good answer. I don't know. That is something we hope to find out in this experiment. When we attempted a method of measuring nitrogen solubility we had our reservations on it and we are using it as a tool only until we get something better. At the moment we don't know that 35 and 45 can be distinguished.

RECENT IMPROVEMENTS IN CLEANING COTTONSEED AT GINS

By

D. D. Day, Vice President
The Murray Company of Texas, Inc.
Dallas, Texas

During the past two of three years there have been developments in equipment for cleaning seed cotton prior to ginning which appear to have the capabilities, when properly used in connection with a modern cotton ginning plant, of removing such a very high percentage of the types of trash especially objectionable to operators of cottonseed oil mills, in these processes prior to the actual separation of lint and seed, that will result in the delivery of cottonseed from the ginning plant a great deal nearer completely free of the types of trash so objectionable.

This new principle of cleaning seed cotton prior to ginning was, to the best of my knowledge, first used experimentally at U. S. Department of Agriculture Cotton Ginning Laboratory, Stoneville, Mississippi. During the past couple of years it has been further developed and commercially produced by manufacturers of cotton ginning machinery.

This principle can be described as the use of saw cylinders with relatively high rim speed, operating over and in conjunction with widely spaced grid bars. Tests clearly indicate machines incorporating this cleaning principle remove from the seed cotton much higher percentages of stems, branches, leaf, and hull particles than it has been possible to remove heretofore with the types of equipment in general use for many years. I should probably add at this point that certain patents are pending in connection with cleaning and/or reclaiming principles referred to.

The largest manufacturer of extractor-feeders installed a few sets of machines prior to the 1954 ginning season equipped with cleaning principles described. Prior to the 1955 ginning season, this same company installed around 600 of these machines, which would mean that probably somewhere between 150 and 200 cotton gin plants were so equipped during the 1955 ginning season. I feel sure that a great many more plants will be similarly equipped prior to the 1956 ginning season. These machines work between the distributor and the gin stand.

During 1955 we developed a machine which includes the same principles and handling sequences as those used in the extractor-feeders referred to, but which is a single-unit machine 14 feet long, and which works directly on the cotton discharge of a conventional 14-foot big bur extractor. This machine uses larger saw cylinders and elements than those used in extractor-feeders, and has the capacity necessary for a complete battery of gins. Approximately ten of these machines were field tested during the 1955 ginning season, and many more with certain refinements will be installed prior to the 1956 ginning season. These machines work between the discharge of the big bur extractor ordinarily used in most modern plants, which removes a large percentage of whole burs and heavy trash, and the intake of the number two major drying system, which is considered a "must" in modern cotton ginning plants designed for handling roughly harvested cotton.

When using the large machine as outlined on discharge of bur machine, it is possible and desirable to also use extractor-feeders on the gin stands which incorporate these new principles outlined. By using this procedure, the cotton is passed through two separate and distinct handlings

by machines both of which are equipped with elements necessary for this new type of cleaning operation. This double cleaning in tandem, of course, produces more perfect results than may be expected from either machine, or groups of machines, working independently.

Even though machines incorporating the new cleaning principles referred to may have wide acceptance, it is of course true that it will be quite a few years before enough gin plants are similarly equipped to materially ease the problems met by you gentlemen who find it necessary to handle cottonseed from all cotton ginning plants favoring your mills with volumes of seed produced by them. I do feel, however, that a long step has been taken in solving these problems by the development of machines incorporating principles I have outlined. I am also sure that in future years better ways and means will be found to accomplish the desired results, as we and other manufacturers are constantly striving to produce machinery which will turn out better products.

DISCUSSION

Verdery: If we could get 2 or 3 plants where this equipment is installed to catch seed samples both while the equipment is in operation and while it is being bypassed, we would be glad to get them analyzed for trash content.

Day: It would be easy to bypass the 14-foot machine, but it would be difficult to bypass the extractor-feeders.

Verdery: If only the 14-foot machine would be bypassed, it would be interesting to see what happens.

Harrell: We can bypass our stick machine, which is the same type that Mr. Day described, very easily in accordance with any sequence.

Day: The tests we have made indicate that this 14-foot machine is over 90 percent effective in stem removal.

Woodruff: In the vicinity of the Upper Mississippi Delta we have been getting more and more grass in the cotton. I wondered if anyone else noticed it.

Harrell: There is no gin machinery that will effectively remove that grass. We are investigating that problem. There has been a lot more grass growth around the Laboratory in the last 3 or 4 years due to the rain and moisture we've had there. The machines are picking the grass out of the fields and there is a bit more grass in the cotton.

COTTONSEED PRODUCTS RESEARCH SUMMARIZED

By

E. A. Gastrock
Southern Regional Research Laboratory

For years the cottonseed industry has bent its efforts, principally, to getting more oil from the seed. As a result of intensive development, you now have a choice between improved types of screw pressing and highly efficient types of solvent extraction.

Oil milling is a highly competitive industry, operating in a highly competitive age. Traditionally, the industry has excess processing capacity so that there is vigorous competition for whatever oilseed raw materials are available. The only basis upon which an oil mill can remain in business in a manner satisfactory to the owners and stockholders as represented by the boards of direction and the managers is to make money on its operation.

Each mill has its own set of conditions to meet. These include seed supply and quality; size of operation and length of operating season; investment, installation and operating costs; yields, operating efficiency and product quality. I would like to emphasize product quality in the rest of my remarks.

Product quality is becoming more important all the time. It is important for all of the products--oil, meal, linters and hulls. I don't think any oil mill can neglect any of its products, nor can it overlook an opportunity to increase their value. For this reason, we need more and more information about these products and the effect of raw material quality and processing conditions on their composition and quality. Furthermore, there must be better communications between producers and users of all of their products so that each product can be made and used to the best advantage. Rather than just grinding out oil, meal, linters and hulls, it will surely pay to produce these products under the highest possible quality specifications. Thus, the producer can sell all of his products competitively with better satisfaction to the buyer and the seller.

I believe our jobs are clearly laid out for us for the next 5 or 10 years in improving the quality of cottonseed products. The cottonseed oil industry must depend more heavily all the time upon the unleashed curiosity of research, coupled with an intense desire to make better products at lower costs in a manner fully in accord with the American tradition.

I think this is the most successful clinic we have had to date, and its success is due mostly to the amount of effort and thought that went into its planning. If the Valley Oilseed Processors' Association decides to hold another clinic in 1957, the planning should start soon.

On behalf of Dr. Fisher and for the Branch, I want to express gratitude and appreciation for the intense interest displayed throughout the meeting, for the excellent attendance, and for the efforts of those who appeared on the program and contributed to its planning.

The Southern Utilization Research Branch will be glad to be host to the 1957 clinic if you choose to hold one next year.

RESOLUTIONS

March 13, 1956

The following resolutions were presented by Messrs. J. B. Perry, Jr., T. H. Baker, Jr., and Garland Harper to the Association, and they were unanimously adopted:

Resolved by those in attendance at the Fifth Cottonseed Processing Clinic held at the Southern Regional Research Laboratory in New Orleans in cooperation with the Valley Oilseed Processors' Association, March 12-13, 1956:

That we extend to Dr. Fisher and the Staff of the Southern Regional Research Laboratory our deep appreciation for the fine conference just concluded and the many courtesies extended to us during this conference including the making of hotel reservations.

We particularly wish to thank the Staff of the Laboratory for the work done on improving the cleaning of cottonseed and the development of the ARS Differentiator and urge that continued research be applied to the problem of cleaning cottonseed and linters to broaden markets for linters by improving quality and thereby increasing the income to the farmer for his cottonseed. While this project is a direct concern of the Valley Clinic and Laboratory, we as members of the industry would feel amiss if we failed to acknowledge the contribution of the Laboratory in past projects and current projects now being conducted by the Laboratory in cooperation with the cottonseed crushing industry.

This clinic has been particularly effective in that it has brought together the producers and consumers of linters to discuss mutual problems with the view to maintain and further increase the outlet of linters by improvement of the product.

We also wish to express our appreciation to those who appeared on our program, realizing the amount of time and study that was necessary in the preparation of subjects discussed on the program.

Signed: ______________________
RESOLUTIONS COMMITTEE

J. B. Perry, Jr.
T. H. Baker, Jr.
Garland Harper

APPENDIX

P R O G R A M

March 12, 1956 - 9:30 a.m.
Auditorium - Third Floor

Chairman, E. F. Pollard, Asst. Head, ED Section, SURB

1. Welcome - C. H. Fisher, Chief, SURB

2. Response - F. H. Jarrell, The Buckeye Cellulose Corp., Little Rock, Arkansas, President V.O.P.A.

SYMPOSIUM ON LINTERS

Part A. Current Information and Problems Related to End Uses for Linters

3. Utilization and Market Potential of Cotton Linters.
   a. J. J. Spadaro, ED Section, SURB
   b. Richard Hall, AMS

4. Use of Cotton Linters in Papermaking
   H. P. Dixson, Fox River Paper Corp., Appleton, Wisconsin

5. Use of Linters in the Automotive, Bedding, Padding, Upholstery and Related Industries
   a. Glenn R. Green, F. Burkart Mfg. Co., Div. of Textron American, Inc. St. Louis, Mo.
   b. David Schimmel, Allen Industries, Inc., Rahway, N. J.

Part B. Marketing of Linters

6. Role of the Linters Dealer in Marketing Linters
   E. R. Kauders, Kauders-Steuber Co., Chicago, Ill.

7. Relation of Second Cut Raw Linters Prices to Second Cut Pulp Prices
   R. R. Milner, Buckeye Cellulose Corp., Memphis, Tenn.

   Luncheon - S.R.R.L.

Part C. Processing Problems Related to Production of Linters

8. Current Reports on Operations at Oil Mills Relating to Cleaning Cottonseed and Production of High Quality Linters
   Allen Smith, Moderator, Perkins Oil Co., Memphis, Tenn.
   Redding Sims, National Blow-Pipe and Mfg. Co., New Orleans, La.
   M. C. Verdery, Anderson, Clayton and Co., Houston, Texas
   Hal Harris, Planters Cotton Oil Co., Greenwood, Miss.
   O. H. Sale, Fertilizer Equip. Sales Corp., Atlanta, Ga.

Part D. New Developments in Cleaning Cottonseed and Linters

9. The New Filter Type Seed Cleaner
   W. F. Phillips, Anderson, Clayton & Company, Houston, Texas

10. The ARS Differentiator
L. L. Holzenthal, Engineering and Development Section, SURB

Part E. Additional Effort Needed to Improve Utilization of Linters

11. Where Do We Go from Here?
E. A. Gastrock, Moderator, Engineering and Development Section, SURB

Part F. Pilot Plant Demonstration

12. Demonstration of ARS Differentiator in Pilot Plant
H. L. E. Vix, Engineering and Development Section, SURB

March 13, 1956 - 9:00 a.m.
Auditorium - Third Floor

Chairmen, Ralph Woodruff, and Allen Smith, VOPA

PROBLEMS AND PROGRESS IN OIL MILL PROCESSING

13. Introductory Statements
Ralph Woodruff, Osceola Products Co., Osceola, Ark.,
Research Committee Chairman, V.O.P.A.
Allen Smith, Perkins Oil Co., Memphis, Tenn.
Program Chairman, V.O.P.A.

14. Unexplained Oil Losses in Processing Cottonseed
J. H. Brawner, Southern Cotton Oil Company, New Orleans, La.
M. H. Fowler, Buckeye Cellulose Corp., Cincinnati, Ohio
F. A. Norris, Swift and Company, Chicago, Ill.
Allen Smith, Perkins Oil Company, Memphis, Tenn.

15. Use of Pressure-Leaf Filters in Filtration of Screw Press Oil
R. T. Grimm, Niagara Filters Division, American Machine & Metals, Inc., East Moline, Ill.

Intermission

16. Refinements in Press Room Work
a. Improvements in Expeller Operations
T. S. Pryor, South Texas Cotton Oil Company, Corpus Christi, Tex.
b. Use of Moisture Meter
Lawrence Hodges, Barrow-Agee Laboratories, Memphis, Tenn.

17. Processing to Minimize Initial Refined Oil Color and Reverted Color
H. D. Fincher, Anderson, Clayton & Company, Houston, Texas

18. Exhaustive Extraction of Cottonseed - Quality and Economic Considerations
P. H. Eaves, Engineering and Development Section, SURB

LUNCHEON AT LABORATORY

19. Present Status of Chemical Methods of Determining Nutritive Value of Cottonseed Meal
A. M. Altschul, Head, Oilseed Section, SURB

20. Recent Improvements in Cleaning Cottonseed at Gins
Dewey Day, Murray Cotton Gin Company, Dallas, Texas

21. Cottonseed Products Research Summarized
E. A. Gastrock, Head, Engineering and Development Section, SURB

22. Report of Resolution Committee

23. Adjournment

24. Meeting of Valley Research Committee immediately after adjournment.

ATTENDANCE LIST

Adams, J. H. Grenada Mill, Mississippi Cottonseed Products Company, P. O. Box 1125, Grenada, Miss.
Allen, T. E., The Southern Cotton Oil Company, National Bank of Commerce Building, New Orleans, La.
Anderson, R. F., Delta Cotton Oil and Fertilizer Co., Jackson, Miss.
Baker, T. H. Jr., Trenton Cotton Oil Co., Box 332, Trenton, Tenn.
Barnett, J. P., Jr., Cotton Products Company, Opelousas, La.
Bayer, Justin J., Paulson Linkroum & Co., 72 Leonard St., New York, N. Y.
Beckham, Otis M., Osceola Products Company, Box 192, Osceola, Ark.
Berkley, Earl E., Anderson, Clayton & Co., 417 La Branch, Houston, Texas
Bredeson, Dean, V. D. Anderson Company, 3212 Medina Avenue, Fort Worth, Tex.
Brooke, Tom R., The French Oil Mill Machinery Co., 146 Seventeenth St., N.E., Atlanta, Ga.
Bryson, Rhett B., Dothan Oil Mill Company, P. O. Drawer 458, Dothan, Ala.
Burner, A. H., The French Oil Mill Machinery Co., Lock Box 920, Piqua, Ohio
Byram, J. E., Jr., Red River Cotton Oil Company, Alexandria, La.
Caldwell, C. H., West Memphis Cotton Oil Mill, West Memphis, Ark.
Caldwell, J. E., Caldwell & Company, Madison, Ga.
Campbell, Woodson, Hollandale Cotton Oil Mill, Hollandale, Miss.
Catlin, Thomas C., Gilbert Paper Company, Menasha, Wis.
Coleman, W. T., Western Cottonoil Division, Anderson Clayton & Company Abilene, Texas
Covington, G. E., Mississippi Cottonseed Products Company, Magnolia, Miss.
Day, Dewey, Murray Cotton Gin Company, P. O. Box 7763, Dallas, Texas
Dillard, E. L., Dothan Oil Mill Co., P. O. Drawer 458, Dothan, Ala.
Dixson, H. P., Fox River Paper Corporation, Appleton, Wis.
Dunklin, I. W., Planters Cotton Oil Mill, Pine Bluff, Ark.
Durham, Warren A., National Blow Pipe & Mfg. Co., P. O. Box 67, New Orleans, La.
Easley, O. D., The Southern Cotton Oil Co., Memphis, Tenn.
Fincher, H. D., Anderson, Clayton Co., Box 2538, Cotton Exchange Bldg., Houston, Texas
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Garner, C. E., Valley Oilseed Processors Association, Inc., 1024 Exchange Bldg., Memphis 3, Tenn.

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George, Ernest T., Jr., Imperial Cotton Oil Co., Macon, Miss.
Gile, E. D., Cotton Products Co., Opelousas, La.
Ginaven, M. E., The Bauer Bros. Co., Box 509, Springfield, Ohio
Goetz, Arno, Reis & Co., Inc., 711 Cotton Exchange, Dallas, Texas
Green, Glenn R., F. Burkart Mfg. Co., Div. of Textron American, Inc., St. Louis, Mo.
Gregory, T. H. National Cottonseed Products Association, 19 S. Cleveland St., Memphis 4, Tenn.
Grimm, R. T., Niagara Filters Div., American Machine & Metals, Inc., East Moline, Ill.
Hamlett, Jesse R., Carver Cotton Gin Co., 146 E. Butler, Memphis, Tenn.
Hammes, R. M., American Machine & Metals, Inc., East Moline, Ill.
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Harris, Hal, Planters Cotton Oil Company, Greenwood, Miss.
Hodges, Lawrence H., Barrow-Agee Laboratories, Inc., P. O. Box 156, Memphis, Tenn.
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Howard, Noland F., Planters Oil Mill, Greenwood, Miss.
Jackson, Donald, Special Crops Sec., Marketing Res. Div., MO&C Branch, AMS, Washington, D. C.
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Jenkins, Alfred, Delta Cotton Oil & Fertilizer Co., Jackson, Miss.
Johnson, Walter J., Memphis Cotton Oil Co., 1701 Thomas St., Memphis, Tenn.
Jones, E. L., Hercules Powder Company, 900 Market St., Wilmington 99, Del.
Kauders, E. R., Kauders-Steuber Company, 221 N. LaSalle St., Chicago, Ill.
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McCabe, C. H., Milwaukee Bedding Co., Milwaukee, Wis.
McClure, O. M., Southern Chemical Cotton Co., Chattanooga 10, Tenn.
McKee, David L., Potts-McKee Co., Memphis, Tenn.
Miller, W. C., Western Cottonoil Company, Abilene, Texas
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Newby, Wales, Cotton Products Co., Opelousas, La.
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Robinson, Cooper, McCallum & Robinson, 481 E. Mallory, Memphis, Tenn.
Rogers, L. N., The Buckeye Cellulose Corp., 2899 Jackson Ave., Memphis 8, Tenn.
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Schimmel, David, Allen Industries, Inc., Rahway, N. J.
Scott, R. H., The Buckeye Cellulose Corp., 2899 Jackson Ave., Memphis 8, Tenn.
Shaw, Billy L. Southern Cotton Oil Co., Greenville, Miss.
Sheffield, Gordon, Railway Supply & Mfg. Co., 229 Falls Bldg., Memphis, Tenn.
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Simpson, George R., Planters Oil Mill, Greenwood, Miss.
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PRESS RELEASE

(This press release of the Conference was furnished on March 16, 1956, to various trade and technical journals and organizations, to the New Orleans newspapers and to a news bureau.)

Cottonseed Clinic stresses the problems of production, marketing and utilization of linters for various end uses. Problems and progress in oil mill processing of cottonseed with emphasis on improved product quality were also discussed.

Resolutions looking toward continued cooperative research in the oilseed industry and close ties with the USDA Southern Regional Research Laboratory were adopted at the Fifth Cottonseed Processing Clinic, held jointly by the Laboratory and the Valley Oilseed Processors' Association in New Orleans, March 12-13, 1956.

Industry representatives approved the following resolutions presented by T. H. Baker, Jr., Member of the Association's Resolutions Committee, from Trenton Cotton Oil Co., Trenton, Tennessee:

RESOLVED: That we extend to Dr. C. H. Fisher and the Staff of the Southern Regional Research Laboratory our deep appreciation for the fine conference just concluded and the many courtesies extended to us during this conference including the making of hotel reservations. We particularly wish to thank the Staff of the Laboratory for the work done on improving the cleaning of cottonseed and the development of the ARS Differentiator and urge that continued research be applied to the problem of cleaning cottonseed and linters to broaden markets for linters by improving quality and thereby increasing the income to the farmer for his cottonseed. While this project is a direct concern of the Valley Clinic and Laboratory, we as members of the industry would feel amiss if we failed to acknowledge the contribution of the Laboratory in past projects and current projects now being conducted by the Laboratory in cooperation with the cottonseed crushing industry.

This Clinic has been particularly effective in that it has brought together the producers and consumers of linters to discuss mutual problems with the view to maintain and further increase the outlet of linters by improvement of the product.

We also wish to express our appreciation to those who appeared on our program, realizing the amount of time and study that was necessary in the preparation of subjects discussed on the program.

One hundred and seven representatives of cottonseed oil mills, equipment manufacturers, users of cottonseed products, linter dealers, commercial laboratories, industry associations, and State and Federal agencies, in addition to staff members of the Southern Laboratory, participated in the 2-day meeting.

Dr. C. H. Fisher, Chief of the Southern Utilization Research Branch, in his opening remarks stated, "Our program this year includes a symposium on linters. I'm certain that we in the Southern Branch will benefit from the information that will be presented at the Symposium. We wish to thank the speakers of the Symposium for coming to New Orleans and appearing on the program."

In his opening remarks, F. H. Jarrell, President of the Association, pointing out the value of these meetings to the oilseed industry, said "The various groups brought together for exchange of ideas on problems of mutual interest within our industry affords an opportunity for the clarification of many of our problems. Through these contacts, many individuals have already improved their operations."

E. F. Pollard, Assistant of the Engineering and Development Section, Southern Utilization Research Branch, presided over the Linters Symposium on the first day. J. J. Spadaro, Engineering and Development Section, Southern Utilization Research Branch, and Richard Hall, Agricultural Marketing Service, discussed the utilization and marketing potential of cotton linters. Mr. Spadaro stated that two factors indicate excellent utilization potential for linters. First, the wide variety of products for which linters can be used, and second, the inherent high quality of linters cellulose. Mr. Hall pointed out that increased utilization this year will reduce carryover but not to the extent potential use under favorable market conditions seem to indicate.

H. P. Dixson, Fox River Paper Corp., reported that linters are now receiving a considerable amount of attention from the cotton segment of the paper industry because rag clippings are becoming an unstable source of fiber due to synthetic fiber additions and more permanent dyestuffs used by textile mills; and that research is underway to increase the use of linters in that industry. Glenn R. Green, F. Burkart Manufacturing Co., and David Schimmel, Allen Industries, Inc., discussed the use of linters in the automotive, bedding, padding, upholstery and related industries. They pointed out the necessity for maintaining a high quality of linters for these end uses.

E. R. Kauders, Kauders-Steuber Co., in discussing the role of the linters dealer in marketing linters, stated "The oil mill industry, in order to keep present linter markets, must assist the linter dealers by: keeping the price of linters in line to meet the ever increasing competition by synthetics such as rubber and other by-products; and maintaining a high quality first cut linters."

R. R. Milner, Buckeye Cellulose Corporation, broughtout that cotton linters pulp should retain its share of the market if the quality and price remain competitive with wood pulp. He stated that bleachers have absorbed increases in costs of labor, processing, freight, chemicals and research.

Allen Smith, Perkins Oil Co.; O. H. Sales, Fertilizer Equipment Sales Corp.; Hal Harris, Mississippi Cottonseed Products Co.; Redding Sims, National Blow Pipe and Mfg. Co.; and M. C. Verdery, Anderson, Clayton and Co., participated in a panel discussion of operations at oil mills relating to cleaning cottonseed and production of high quality linters. This

discussion emphasized the importance of adequate capacity in the lint room and lint cleaning equipment in the production of high quality linters.

W. F. Phillips, Anderson, Clayton and Co., and L. L. Holzenthal, ED Section, Southern Utilization Research Branch, discussed new developments in cleaning cottonseed and linters. Mr. Phillips described a newly developed type of seed cleaner which is now in operation in the industry. Mr. Holzenthal discussed the present stage in development of the Agricultural Research Service Differentiator, a machine for the cleaning and fractionating of cottonseed. He reported that thus far, about half of the foreign matter is removed in one fraction containing about a pound of oil per ton of seed. The clean seed fraction is about 65% at 0.5% foreign matter and 90% at 1.0% foreign matter. Seed are fractionated to an appreciable extent in accordance with seed size, meats content, oil and nitrogen content, oil quality, linters content and length of linters.

E. A. Gastrock, Head, ED Section, Southern Utilization Research Branch discussed additional efforts needed to improve the utilization of linters. He emphasized that it behooves all of the members of the group to consider with the greatest of seriousness the various suggestions made for improving linters and in communicating between producers and users, and to translate these suggestions into action at the earliest possible moment.

H. L. E. Vix, ED Section, Southern Utilization Research Branch, conducted a demonstration of the Agricultural Research Service Differentiator in the pilot plant of the Southern Laboratory, which proved successful in that many expressed interest in this projection device for the cleaning of cottonseed. Besides cleaning of seed the machine shows promise for fractionation of cottonseed in accordance with quality, and for this reason should have application for the selection of seed for planting.

Ralph Woodruff, Osceola Products Co., and Allen Smith, Perkins Oil Co., presided over the second day's program, presented by the Valley Oilseed Processors' Association, which emphasized problems and progress in oil mill processing. Messrs. Woodruff and Smith gave introductory statements relative to the growth of the fine spirit of cooperation between the Valley Oilseed Processors' Association and the Southern Regional Research Laboratory.

J. H. Brawner, Southern Cotton Oil Co.; M. H. Fowler, Buckeye Cotton Oil Co.; F. A. Norris, Swift and Co.; and Allen Smith, Perkins Oil Co., participated in a panel discussion of unexplained oil losses in processing cottonseed. This discussion included the relation between the moisture in cottonseed and the nearness that a mill approaches the calculated or expected oil yield to the refining loss of crude oil produced; and the need for additional analyses in studying unexplained oil losses in expeller and screw-press operations.

R. T. Grimm, Niagara Filters Division of American Machine and Metals, Inc., stated, "The Niagara horizontal style pressure-leaf filter, first introduced to the vegetable oil industry in 1951 has been recently tested and proven under actual mill operating conditions on pre-screened cottonseed oil from mechanical screw presses. Advantages include simple one-man operation, reduced cake discharge time, totally enclosed operation, better housekeeping, reduced downtime and elimination of leakage."

T. S. Pryor, South Texas Cotton Oil Company, described the cooking and pressing equipment at several mills using high speed expellers and screw presses, and pointed out the important factors in this type of operation.

Lawrence Hodges, Barrow-Agee Laboratories, described the use of the moisture meter in the press room and in solvent plants. He stated, "Use of this instrument provides a quick, on-the-spot method for determining moisture; and most mills using the instrument have the press room operator make the tests at periodic intervals."

H. D. Fincher, Anderson, Clayton and Co., discussed processing to minimize initial refined oil color and reverted color. He said, "The amount of gossypol and its derivatives finding their way into the oil is minimized by control of moisture, temperature, and time so that most of the pigment glands are ruptured in the early stages of processing; and rupture of the glands with release of gossypol at this point favors having the pigment remain with the meal rather than going with the oil."

P. H. Eaves, Engineering and Development Section, Southern Utilization Research Branch, discussed the exhaustive extraction of cottonseed - quality and economic considerations. He reported that both refining losses and refined oil colors tended to increase with increasing degree of total oil extraction. Refining losses of the oils from the cooked meats were of a very low order as compared to those of the oils from raw and tempered meats and increased only slightly as the degree of total lipides extraction increased. However, it was found that the dollar return from a given tonnage of seed tended to be favorably affected by the more exhaustive degree of extraction.

A. M. Altschul, Head, Oilseed Section, Southern Utilization Research Branch, discussed the present status of chemical methods for determining the nutritive value of cottonseed meal. He reported that 60 tons of diets containing mixed cottonseed and soybean meals are being submitted to nutritionists in industry, state and federal agencies for evaluation on a large scale. He emphasized the necessity of investigating the complete chemistry of cottonseed and its products.

D. D. Day, The Murray Company of Texas, Inc., described recent developments in equipment for cleaning seed cotton prior to ginning which have capabilities of removing a high percentage of the types of trash especially objectionable to operators of cottonseed oil mills."

E. A. Gastrock, Head, ED Section, Southern Utilization Research Branch, in discussing cottonseed products research, stated that since the residual oil in cottonseed meal has been reduced to below 1% with the advent of solvent extraction, the oil mill operator must pay greater attention to the quality of his products - oil, meal, linters and hulls. Cottonseed oil mills must depend more heavily upon the unleashed curiosity of research, emphasizing better products at lower costs.